The Refrigeration Service Engineer

VOL. 6::NO. 9
SEPTEMBER
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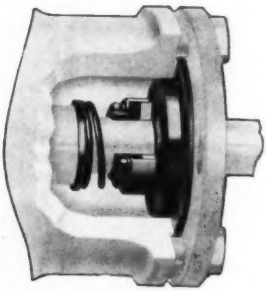

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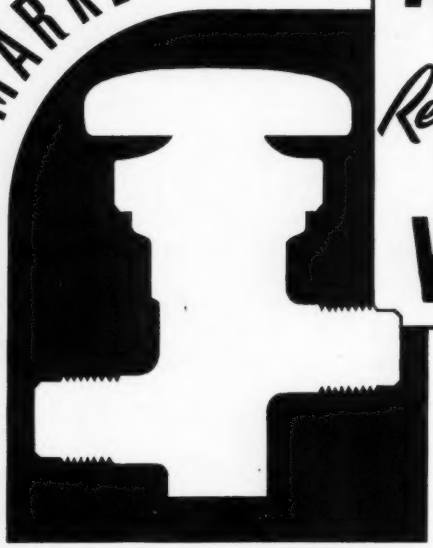

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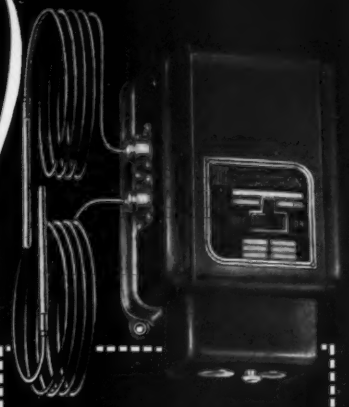

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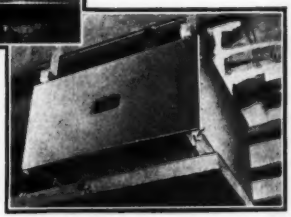

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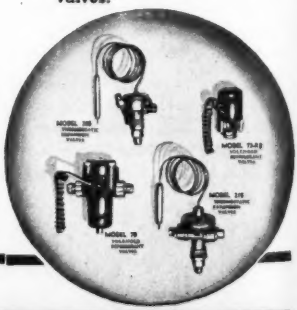

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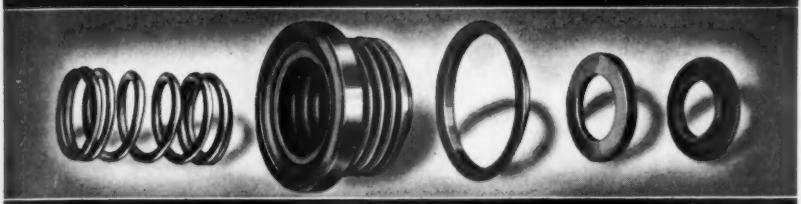

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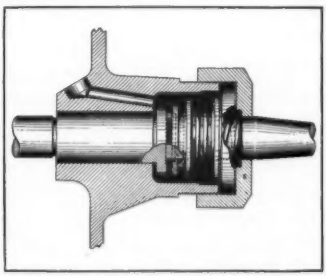

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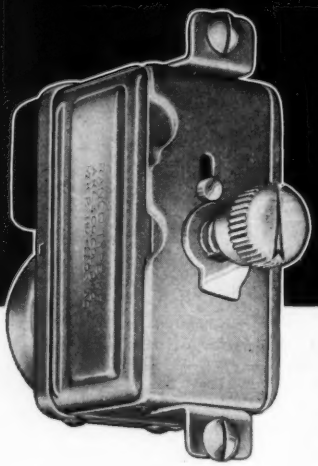

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The Refrigeration Service Engineer

Vol. 6 No. 9

September, 1938

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
REFRIGERATION SERVICE ENGINEERS SOCIETY

Published by
Nickerson & Collins Co.
433-435 North Waller Ave.
Chicago

Telephones Austin 1303-1304-1305

EASTERN OFFICE
420 Lexington, New York City
Telephone Lexington 2-4816

Publishers of Technical Books and Trade Journals Serving the Refrigeration Industries for 46 years.

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The Refrigeration Service Engineer

Vol. 6, No. 9 CHICAGO, SEPTEMBER, 1938 $2.00 per Annum

Motor Capacitors

Their Purpose, Construction, and Means of Testing

By WALLACE N. KEY *

A FEW years ago, as everything in the home became electrified and many motors of a fractional horsepower were added to the existing lighting load, electric utilities found themselves confronted with what was to them a serious problem. In meeting the electrical demand for a lighting load, it was necessary to supply only enough electricity for a peak load over certain hours. This demand was fairly constant from hour to hour, and did not reach any alarming peaks. Kilowatt hour rating of distribution lines, transformers and generators was, therefore, held in conformity with the average kilowatt hour consumed. With the addition of automatic motor-driven appliances, which make numerous starts each day, the situation changed.

When a motor starts, it consumes from two to three times the amount of energy during the starting period as it does during the running period. Even though this starting period and the consequent high demand on the distribution equipment exists for as short a period as three to thirty seconds, it becomes necessary for the utilities to provide distribution and generating equipment with a capacity twice that required to meet the average demand of any hourly period. Such a condition meant that eventually the cost of electricity would have to be increased to cover this additional cost of distributional equipment, and because of the higher operating cost of electric motors, manufacturers of electrical appliances would find a greater sales resistance to their product.

The utilities' answer to this situation was the installation of a demand meter on the customer's premises, which registered the highest amount of current drawn through the meter at any time. The customer was required to pay for this demand in addition to the kilowatt hours consumed.

The electrical industry's answer to the problem, however, was the electrolytic condenser, or capacitor. The purpose of a capacitor on a motor is essentially the same as that on any other electrical device. It limits the amount of current passing through it to the electrical device. The effect on the motor, therefore, is to eliminate that momentary high bump on the supply line, reducing the high current going to the motor, and spreading it out over a longer period of time. The starting period of the motor, of course, is lengthened accordingly.

As an example of this, we might consider a motor, without a capacitor, which is rated

* Chemist—Economy Condenser Corp., Chicago, Ill.

at 2.4 amperes. This means that under full load conditions the motor when running will draw 2.4 amperes. If this were the only load on the electric meter, and it never exceeded this amount, you would pay only for the 2.4 amperes per hour, and the electric company would be expected to supply distribution equipment to the premises large enough to carry 2.4 amperes and no more. The motor, however, upon starting, draws approximately six amperes for a period of perhaps one second, which makes it necessary for the electric company to install distribution equipment capable of delivering six amperes. The cost of the larger equipment is greater, and, therefore, the cost of delivering 2.4 amperes is greater. To overcome this, we install a capacitor in series with the starting winding of the motor, as illustrated in Fig. 1, which we will say will not permit more than 3.5 amperes to pass through it. The result is that our motor, which had a peak of six amperes for one second, now has a peak of 3.5 amperes for three seconds. This, of course, reduces the demand on the

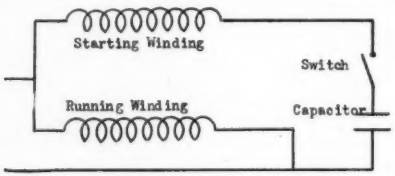


Fig. 1. Showing Where Capacitor Is Connected in Motor Circuit

electric lines and the cost of distribution equipment.

Fundamentally, an electrolytic capacitor consists of two metal surfaces, separated by a dielectric medium and immersed in a suitable electrolyte. The size, or capacity, of the capacitor is directly proportionate to the square inch surface of the two conductors. Two general types are made. One of these, the polarized type to be used on d.c. current, is distinguished by the provision of a negative and positive lead in different colors. The other, for use on a.c. current, has two common leads of identical color. Since the refrigeration service engineer is interested only in the latter type, as applied to electric motors, we will deal with it exclusively.

Where Capacitators May Be Used

Motor starting capacitors can only be used on intermittent duty and, therefore, can be easily damaged by the failure of the motor, such as a defective bearing, defective centrifugal switch, or shorted turns in the motor windings, which may cause the motor to stall or continue to run on the starting winding. It is important to check and determine that all associated equipment is in good working order before replacing a new capacitor.

Effects of Temperature

Too many starts per hour, or too high room or ambient temperature, will cause excessive increase in current leakage and, likewise, will increase the power factor, and the power factor is what governs the usefulness of a.c. types of electrolytic capacitors. In other words, it will not function continuously, or for long periods, on a.c. current, due to its high power factor losses, unless the heat generated is dissipated fast enough so that no further increase in power factor takes place—but by virtue of its physical shape, construction, and its chemical and electrical characteristics—also, its position on the motor—it is impossible for the capacitor to radiate the heat generated internally by its power factor losses rapidly enough to prevent a temperature rise above its slow equilibrium value, after which self-destruction sets in.

A capacitor should not be subjected to more than 20 starts per hour, and each start should not exceed three seconds, and at no time should it be across the line more than 15 seconds.

Decreases in temperature below 60 degrees F. cause losses in capacity and large decreases in electrical leakage. At 20 degrees below zero F. the capacitor will have lost approximately one-fourth its capacity, and at 30 degrees below zero it will have lost approximately one-half its capacity, but will still function. However, if a capacitor is to be subjected to extremely low working temperatures, one of higher capacity should be used rather than one rated at 60 degrees F., as the manufacturer sets the capacity at 60 degrees F. Extreme decreases in temperature cause loss of effective capacity, but this causes no permanent injury to the capacitor, and normal characteristics will be resumed when the temperature is again raised to normal.

Shelf-Life or Idle-Life

Motor starting capacitors which have been on shelf-life, or idle for long periods of time, will show reductions in their effectiveness. This condition can be remedied by two methods. First, by applying rated direct current

in one direction through the capacitor until the direct current leakage has dropped to normal, and then reverse the leads and apply direct current until the leakage has dropped to normal. This is called the ageing period. Second, apply a.c. operating voltage in periods of three seconds at a time until the leakage has dropped to normal.

Life of Motor Starting Capacitators

The ultimate effective life of a motor starting capacitor depends on many conditions, such as working voltage, heat, idle hours, and the quantity of electrolyte occluded between the two anodes. This is true because of the fact that the anodic film of aluminum oxide, which serves as the dielectric medium, must, when under operating conditions, be constantly maintained and, to a great extent, be replaced. This maintenance, or replacement, must come from the electrolyte in the form of oxygen by the process of electrolysis, as this replacement process goes on although oxygen in the electrolyte is used up, and the specific resistivity of the electrolyte increases. The increase in electrolyte resistivity causes an increase in the equivalent series resistance and, likewise, a decrease in the effective capacitative reactance. As the oxygen is lost, the electrolyte dries, and there is an increase in the constant resistance of the electrolyte to the aluminum anode surface. This causes more equivalent series resistance and a decrease in capacity. With a decrease in capacity, it takes longer for the motor to start, which causes the capacitor to heat, and, as previously stated, heat causes losses in capacity, and the capacitor eventually fails to start the motor. So for long life and good service, put in a good capacitor and see that it is not subjected to more than 20 starts per hour, and, if it is idle for several months, see that it is properly aged before putting in service again.

Effects of Voltages Other Than the Rated Operating Voltage

When a capacitor is operated at a voltage lower than the formation voltage, a slow adjustment to the new voltage condition takes place. On continued operation at lower voltage, the capacity will gradually increase because the film thickness is reduced on the metal surfaces of the anodes. The time of this action is affected by the type of electrolyte used, and the temperature; therefore, it would be unwise to put a 220-volt capacitor in service on 110 volts. Likewise, if a 110-volt capacitor has 220 volts applied to it, the capacitor, if it does not break down, will get excessively hot due to the fact that the new voltage is coating the surfaces of the anodes to a higher voltage than the original forming voltage, and will cause the capacitor to lose capacity.

In servicing hermetically-sealed units, equipped with capacitor start motors, the service engineer is confronted with three definite problems:

(1) How to determine whether or not the capacitor is defective.
(2) Because so many capacitors in the original equipment are not marked as to capacity, how to determine what size to order for replacement.
(3) What to do about temporary service for the customer while a new capacitor is being secured.

Some of those who have sought to solve these first two problems have tried to secure, or develop, an instrument of some kind which will measure the capacity of these devices. With such an instrument, it was hoped they would know what replacement to order, and

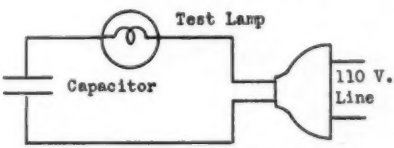


Fig. 2. Test Hook Up for Capacitors

whether or not the capacitor was defective, or worn out. The uselessness of such an instrument can be thoroughly understood from the following:

The electrolyte in which the two metal surfaces, or anodes, are immersed, contains a chemical which liberates oxygen by electrolysis. As current passes through the electrolyte, part of the chemical is used up, or dissipated, in gaseous forms. Heat increases the action and speeds up the dissipation of the chemical. Thus, a gradual wearing out, or deterioration, takes place, which eventually causes the capacitor to short out, or become ineffective. Long periods of use, such as caused by a motor failing to get up to speed and kicking off the starting winding, will speed up the deterioration, due primarily to the heat generated during the prolonged period of operation on high current. During this process of deterioration, the capacitor gradually loses capacity, so that, for example, a 90 mfd. capacitor, after a considerable period

of service, may only measure 60 mfd. A capacitor that has failed in operation will, of course, not register at all; therefore, the uselessness of an instrument, as mentioned in the foregoing.

There are only two things that can happen to a capacitor when it has become ineffective. First, it may be shorted, which means that the current has found an unobstructed path from one conductor to the other. This, of course, is caused by the complete dissipation of the chemical coating at some point, and the breaking down of the insulation between conductors. Second, in an open capacitor, which means that through electrolysis, or damage, the connecting leads to

Fig. 3. The Capacitor Test Box

the conductors, or the conductors themselves, have become broken, or open-circuited, so that current does not reach the conductor. With this in mind, then, it becomes a very simple matter to determine when a capacitor is defective.

Connect the doubtful capacitor in series with a test lamp and a 110-volt line, as shown in Fig. 2. If the lamp will not light, the capacitor is open-circuited. If the lamp does light, leave it connected for about 10 seconds, or the length of time it takes to count ten. This is termed the charging period. Upon removal of the plug to the 110-volt line, touch the two capacitor leads together. If it is not defective and will take a charge, a noticeable spark will occur when the two wires come in contact. If no spark is evident, the capacitor is shorted. It should be noted here, however, that with this test, the lamp will light if the capacitor is okay, or if it is shorted. It will not light if there is an open-circuit.

The next problem of the service engineer is not so easy to overcome with the material on hand, and because the average source of supply does not seem able to inform the service engineer of the capacity required from the motor data, the problem becomes a serious one. The writer has developed two methods of overcoming this particular problem. In the first method, it is necessary that you inform me of the motor ampere rating. From this information, it is possible to determine the capacity required. This method, however, entails too much delay and inconvenience, and there is still a third problem to be solved; therefore, the second solution, which involves the use of a device we are now manufacturing, and with which all three of the problems may be solved, seems the better of the two.

The Test Box in Practice

The device consists of an inexpensive capacitor arrangement, illustrated in Fig. 3. It is small and compact in size with two leads and a selector dial. By manipulation of the dial it is possible to obtain capacities of 50, 80, 100, 115, 135 and 150 mfd. In practice the device may be used as follows:

If, for some reason, the hermetically-sealed unit will not start, and after checking wiring, relays, thermostat, fuse, etc., you have reason to suspect capacitor failure, remove the old capacitor, and connect in its place the two leads of the test capacitor. Turn the knob to the number one or 50 mfd. position, plug in the motor cord and, if the motor does not reach rated speed and throw off the starting winding within three seconds, pull the plug and stop the motor. Turn the knob to the second or 80 mfd. position and again plug in the cord. Repeat these operations until sufficient capacity has been reached to start the motor and throw off the starting winding within three seconds. When this point has been reached, you have determined the size capacitor required for replacement. *Caution:* Never turn the knob

on the test capacitor while the motor cord is connected!

In this manner, you have solved two of the problems: first, that the old capacitor was defective if, upon replacing with the test capacitor, the motor will start; second, you have determined the capacity required for replacement.

The third use for the device is the fact that it may be left in the circuit, and used as a replacement until such time as a new one may be secured. Before leaving the service job for any length of time, it is advisable, where the capacitor has failed, to inspect the switch contained in the motor for the purpose of disconnecting the starting winding, to be sure that it operates freely, and that the contacts are thoroughly clean. Also, test and inspect the starting winding to be sure that a burn-out has not occurred at this point.

A rather confusing point about some types of capacitors installed on motors is the fact that they contain four terminals, or leads, as shown in Fig. 4. These are usually marked "T," "TL," "L" and one unmarked terminal. These letters refer to thermostat, thermostat and line, and line. Those terminals marked "T" and "TL" are dummy terminals, being used only as an anchorage point for the motor connections. The capacitor terminals are the unmarked terminal and that marked "L."

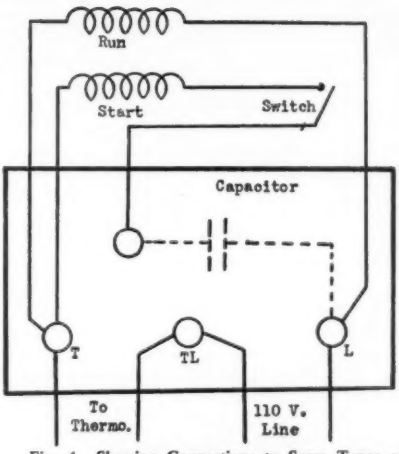


Fig. 4. Showing Connections to Some Types of Capacitors

Copper and Copper Alloys

A brief summary of the important properties and typical industrial applications of thirty representative coppers and copper base alloys

by M. G. STEELE *

THE accompanying chart presents, in tabular form, a schedule of thirty typical coppers and copper alloys which are more or less fundamental in character. The metals which are listed on this schedule represent most of the typical commercial forms in which wrought copper and copper base alloys are manufactured. Certain important properties are listed, the forms in which each is commercially supplied are given as well as properties, uses and methods of fabrication.

The metals have been arranged in six groups for clearness: the coppers, the brasses, the special brasses, the bronzes, the nickel silvers and the cupro-nickels. A discussion of the metals contained in this list will give a clear idea of their characteristics and uses and a definite picture of a basic group of typical coppers and copper base alloys.

The composition of each copper or copper base alloy is given in the attached schedule and it will be noted that each group is arranged in order of decreasing copper content. The tensile strength, as well as the elastic limit and elongation for both the hard and soft conditions, is given in each case. The upper figures are for the hard metal and the lower figures for the soft metal. These figures are predicated on the properties of sheet material and will vary slightly for rod, tube, plate, etc.

* Technical Adviser, Revere Copper and Brass, Inc., Baltimore Division.

Abstract of an address before the Baltimore Purchasing Agents Association, November, 1937.

The tensile strength is, of course, the stress, expressed in pounds per square inch, required to break a given metal in tension.

The elongation is the percentage increase in length observed in a 2-inch length of the test sample before fracture. The 2 inches are taken at the reduced diameter section where fracture takes place. The elongation is an index of the ductility of a metal.

Another measure of ductility is the so-called "reduction of area." This is the ratio between the area of the smallest cross-section of the test specimen at the time of fracture and the original area at the same point before stress is applied.

The elastic limit is the greatest stress, expressed in pounds per square inch, which a material is capable of withstanding without a permanent set or deformation remaining upon complete release of the stress.

Other physical properties such as thermal and electrical conductivity, melting point, coefficient of expansion, etc., have not been given, for lack of space, but can be easily obtained from textbooks on metals.

When tensile strength is used as a design value it is customary to divide this value by a safety factor such as, say five or six, to obtain a conservative working stress for the metal. In some cases it may be desirable to use elastic limit as a basis for determining a suitable working pressure.

Degrees of Hardness

These metals are manufactured with different standard degrees of hardness or "temper." This hardness is obtained by cold rolling after the last annealing, and it depends upon the percentage of cold reduction rather than on the passes through the roll. When the thickness is reduced one number of the B & S gauge; that is, when a No. 18 sheet (.040-inch) is reduced to No. 19 (0.036-inch), the resulting sheet is known as ¼ hard. When reduced two numbers it is ½ hard, three numbers ¾ hard, and when reduced four numbers it is hard. Extra hard is obtained by the reduction of six numbers, spring hard by eight numbers, and extra spring hard by ten numbers. However, the softness of the metal before the final rolling has an influence, and if very close limits of temper are desired, the hardness number on some standard testing machines must be specified.

While numbers are applied to the degrees of hardness in the tempered metals, the determination of grain size is the method of testing the relative softness. The degrees of softness are dependent upon the finished grain size, which is produced by a control of the final annealing operations. A large grain denotes a soft material and a fine grain denotes a hard material. All grain sizes are measured in millimeters at 75 diameters magnification.

Copper

To most people copper is merely copper whereas, as a matter of fact, there are several varieties of copper that vary widely in their characteristics and properties. The writer has chosen six important types for discussion.

These are arranged for convenience in the order of increasing tensile strength:

1. Electrolytic Copper.

The bulk of all wrought copper is electrolytic copper. It has high resistance to corrosion, high conductivity, great ductility and an attractive appearance. It is obtainable in almost every wrought form. It may be stamped, formed, drawn, forged, welded and soldered.

It has many uses including bus bar, high conductivity tubing for electrical uses, house roofing, flashing, gutters and spouting, kettles, vats, gaskets, print rolls, lock seam tubing, forgings, and for coppersmithing.

Sheet electrolytic copper is furnished in electro-plated finishes including tin, nickel, chrome and lead, and in hot dipped tin and lead finishes.

2. Lake Copper.

This contains commercially about seven ounces of silver per ton, which materially increases its annealing (softening) temperature. This is very advantageous where it is subjected to operations involving dipping in molten solder as in the manufacture of automobile radiators. Its conductivity is equal to that of electrolytic if free from arsenic. It is used for radiator cores and thin lock seam tubing.

3. Phosphorized Copper.

Phosphorous is added to this copper to remove all oxygen. It is used for applications where the presence of oxygen would be harmful, as for example, where a copper of exceptionally high ductility is required, or when it is to be welded. Its electrical conductivity is not as great as that of electrolytic copper and for high conductivity tubing electrolytic is used.

COPPER AND COPPER BASE ALLOYS. (WROUGHT TYPES)

NUMBER.	NAME OF COPPER OR ALLOY.	COMPOSITION: COPPER	ZINC	LEAD	TIN	NICKEL	TENSILE STRENGTH (HARD AND SOFT) LBS. PER SQ. IN.	ELONGATION IN 2 INCHES %	ELASTIC LIMIT (HARD AND SOFT) LBS. PER SQ. IN.	WROUGHT FORMS.	PROPERTIES AND USES.	METHODS OF WORKING.
1	COPPER (ELECTROLYTIC)	99.9					51,000 32,500	4 47	48,000 12,000	SHEET·BAR TUBE·ROD PLATE·ETC.	CORROSION RESISTANCE·DUCTILITY HIGH CONDUCTIVITY·ROOFING·BUS BAR HIGH CONDUCTIVITY TUBING	STAMP·DRAW WELD·SOLDER FORGE·EMBOSS
2	COPPER (LAKE)	99.9	SILVER 7 OZ. PER TON				51,000 32,000	4 47	48,000 12,000	SHEET STRIP ROD	HIGH ANNEALED PRINT AUTO RADIATOR FINS. LOCK SEAM TUBING	STAMP·DRAW SOLDER FORM
3	COPPER (PHOSPHORIZED)	99.9	.04 PHOSPHOROUS MAX.				55,000 35,000	5 45	44,000 16,000	SHEET STRIP TUBE	WATER, REFRIGERATOR AND OIL-BURNER TUBING. DRAWS AND COILS BETTER THAN No.1	STAMP·DRAW FORGE
4	COPPER (ARSENICAL)	99.9	.04 PHOSPHOROUS .30 ARSENIC				60,000 36,000	4 40	55,000 7,000	SHEET TUBE PLATE	HIGH STRENGTH-RESISTS HEAT AND FLAKING. CONDENSER TUBES	STAMP DRAW FORGE
5	COPPER (CADMIUM)	99	1.00 CADMIUM				80,000 35,000	4 45	68,000	ROD	HIGH STRENGTH HIGH STRENGTH PARTS TROLLEY WIRE	DRAW FORGE
6	COPPER (BERYLLIUM)	98	2.00 BERYLLIUM				175,000 75,000	6 45	134,000 31,000	SHEET TUBE ROD	VERY HIGH STRENGTH-HARDNESS HIGH CONDUCTIVITY - SPRINGS HIGH SPARKING CUTTING TOOLS ETC	STAMP·DRAW FORGE·FORM
	→ BRASSES ←											
7	GILDING METAL	95	5				55,000 35,000	5 38	39,000 11,000	SHEET STRIP TUBE	DUCTILITY - REDDISH GOLD COLOR PRIMERS. DETONATOR FUSE CAPS JEWELRY - FORGINGS	STAMP·DRAW FORGE FORM
8	COMMERCIAL BRONZE	90	10				67,000 37,000	3 40	53,000 11,000	SHEET STRIP TUBE	DUCTILITY - USED FOR COLOR MATCH STAMPED HARDWARE - BULLET JACKETS JEWELRY - CASKETS - SCREEN CLOTH	STAMP·DRAW FORGE·FORM PERFORATE
9	RICH LOW BRASS	85	15				75,000 42,000	4 43	52,000 15,000	SHEET STRIP TUBE	CORROSION RESISTANT - BRASS PIPE JEWELRY·BADGES, NAME PLATES ETCHINGS - TAGS - DIALS, ETC	STAMP·FORM DRAW·BLANK ETCH·WELD
10	LOW BRASS	80	20				85,000 43,000	4 50	65,000 15,000	SHEET STRIP TUBE	CORROSION RESISTANCE JEWELRY (FOR GOLD PLATING) FULTON BELLOWS - YELLOW COLOR	STAMP·FORM DRAW·SPIN
11	SEVENTY THIRTY CARTRIDGE BRASS	70	30				86,000 45,000	4 50	65,000 15,000	SHEET STRIP TUBE	HIGH DUCTILITY - DEEP DRAWING PAN, RIVETS EYELETS, RADIATOR & CARTRIDGE SHELLS - SPINNING	STAMP·SPIN DEEP DRAWING
12	HIGH BRASS	66	34				90,000 48,000	4 50	70,000 15,000	SHEET STRIP	HIGH DUCTILITY - DEEP DRAWING BRASS PIPE - AUTO REFLECTORS STAMPINGS - RADIATOR FINS, ETC.	STAMP·SPIN DEEP DRAWING
13	LEADED HIGH BRASS	65	33.5	1.5			80,000 45,000	5 60	60,000 15,000	SHEET STRIP	ENGRAVERS BRASS - LIGHTING FIXTURES CLOCKS AND WATCH BACKS - GEARS - KEYS FORGING BY BENDING FREE MACHINING	STAMP·FORM BEND·PUNCH
14	FREE CUTTING ROD	62	35	3			62,000 47,000	20 60	25,000 15,000	ROD	TYPICAL BRASS ROD FREE MACHINING - EXTRUDED SHAPES SCREW MACHINE PARTS	MACHINE THREAD EXTRUDE
15	FORGING ROD	60	38	2			70,000 50,000	10 45	31,000 15,000	ROD	HOT FORGINGS FAUCET HANDLES - SHOWER HEADS	FORGE MACHINE EXTRUDE
16	MUNTZ METAL	60	40				80,000 57,000	8.5 48	60,000 16,000	SHEET PLATE TUBES	CONDENSER TUBES AND HEADS SHIP SHEATHING - LARGE SHEETS PERFORATED METAL - BRAZING ROD	DRAW·PUNCH EXTRUDE
17	ARCHITECTURAL BRONZE	56	41.25	2.75			70,000 50,000	10 20	55,000 15,000	SHEET STRIP	STRENGTH - HARDNESS - FREE CUTTING EXTRUDED SHAPES - FORGINGS INTERIOR ORNAMENTAL BRONZE	EXTRUDE FORGE MACHINE
	→ SPECIAL BRASSES ←											
18	SILICON BRASS	78	20			2.00 SILICON	110,000 55,000	4 61	83,000 12,500	SHEET STRIP	HIGH STRENGTH - WELDABILITY REFRIGERATOR EVAPORATORS FIRE EXTINGUISHER SHELLS	RESISTANCE WELD STAMP DRAW
19	ALUMINUM BRASS	76	22			2.00 ALUMINUM	83,000 62,000	17 52	75,000 62,000	TUBE	RESISTANCE TO CORROSION AND EROSION SELF HEALING SKIN CONDENSER TUBES	DRAW EXTRUDE
20	ADMIRALTY	71	28		1		95,000 45,000	5 60	92,000 18,000	SHEET STRIP TUBE	RESISTANCE TO CORROSION, ESPECIALLY OF SEA WATER CONDENSER TUBES	STAMP DRAW EXTRUDE
21	NAVAL BRASS	60	39.25		.75		75,000 54,000	15 45	39,000 16,000	SHEET ROD TUBE	RESISTANCE TO CORROSION SEA WATER SUB HEADS - MARINE SHAFTING BOLTS FORGED PARTS - WINDOW ANCHORS	DRAW FORGE
	→ BRONZES ←											
22	PHOSPHOR BRONZE	98.75	.05 PHOSPHORIC		1.2		65,000 40,000	4 48	50,000 15,000	SHEET STRIP	RESILIENCE - STRENGTH - HARDNESS RESISTANCE TO CORROSION SPRINGS·BEARINGS MISC. SMALL PARTS	STAMP FORM WELD
23	PHOSPHOR BRONZE	92	.05 PHOSPHORUS		8		110,000 55,000	3 55	85,000 25,000	SHEET STRIP ROD	SIMILAR TO No. 22 ABOVE WELDING ROD	STAMP FORM WELD
24	SILICON BRONZE	96.25	3.25 SILICON		.50		110,000 60,000	5 55	100,000 25,000	SHEET TUBE ROD ETC	STRENGTH - WELDABILITY - CORR RESIST TANKS - BOLTS - SCREWS LAGS - CHAIN LOCOMOTIVE RUB LINERS - WELDING ROD	STAMP·DRAW FORGE·WELD EXTRUDE·CAST
25	ALUMINUM BRONZE	95	5.00 ALSHINUM				105,000 57,000	5 55	80,000 24,000	SHEET TUBE ROD	CORROSION RESISTANCE - STRENGTH GOLDEN COLOR CONDENSER TUBES - GIFT ARTICLES	STAMP EXTRUDE DRAW
26	MANGANESE BRONZE	59	39	1.25 IRON	.75	.05 MANG.	75,000 60,000	5 35	50,000 15,000	SHEET STRIP ROD	RESISTANCE TO WEAR AND CORROSION WELDING ROD - PERF. COAL SCREENS EXTRUDED WEARING PARTS	EXTRUDE PERFORATE WELD
	→ NICKEL SILVERS ←											
27	NICKEL SILVER (TYPICAL)	65	20			15	93,000 58,000	5.5 45	75,000 15,000	SHEET STRIP ROD	RESISTANCE TO CORROSION - STRENGTH EXTRUDED SHAPES - TABLE SILVER INSTRUMENTS - KEY STOCK - SPRINGS	FORGE EXTRUDE STAMP
	→ CUPRO NICKELS ←											
28	CUPRO NICKEL (EIGHTY TWENTY)	80				20	80,000 49,000	3 42	78,000 17,000	TUBE	RESISTANCE TO CORROSION EROSION, HEAT AND CHEMICAL ATTACK CONDENSER TUBES	
29	CUPRO NICKEL (SEVENTY THIRTY)	70				30	84,000 49,000	4 50	83,000 18,300	TUBE	SAME AS No 28 ABOVE BUT MORE RESISTANT TO CORROSION ETC CONDENSER TUBES	
30	CUPRO NICKEL (ZINC ALLOY)	75	5			20	85,000 50,000	5 35	77,000 23,000	SHEET TUBE ROD	SAME AS No 28 ABOVE BUT LESS RESISTANT TO CORROSION ETC CONDENSER TUBES	

PREPARED BY M.G. STEELE, TECHNICAL ADVISOR, BALTIMORE DIVISION, REVERE COPPER AND BRASS, INCORPORATED. 11-15-37

Phosphorized copper is used for water, refrigeration and oil burner tubing; in fact, for most copper tube requirements because it draws and coils better. Copper tube, hot tin coated inside and outside by a new process, is available and has several important applications.

4. Arsenical Copper.

The inclusion of a small amount of arsenic in copper gives it greater tensile strength and hardness; it also increases its resistance to heat and to flaking. For this reason it is often used for heat-resisting condenser tubes.

5. Cadmium Copper.

Cadmium copper has higher tensile strength than the preceding coppers and good electrical conductivity. For this reason it finds extensive application for trolley wire. In the wire form, strengths of 92,000 p.s.i. with an electrical conductivity of 80 per cent are readily obtainable in the cold-drawn alloy.

6. Beryllium Copper.

Beryllium copper is a recent and interesting development. The introduction of about 2 per cent of beryllium into copper gives it phenomenal qualities of tensile strength and hardness together with good ductility. It can be heat treated to procure these values. It has high conductivity.

It has a wide potential range of applications which are limited at the present time by high cost. It is used for non-sparking cutting tools, springs and high strength parts where high conductivity is important.

Brass

Brass is an alloy of copper and zinc in varying proportions. Brasses are more ductile than the corresponding copper-tin alloys or bronzes but are not as hard. When the zinc content exceeds 45 per cent, however, the alloy becomes very brittle. Brass is malleable and can be readily worked cold. Like most metals, it becomes hard when cold worked but it can be annealed by simply heating and cooling.

The normal designations of annealed brass are: deep drawing, drawing, and light annealed, which are sometimes also designated as dead soft, soft, and light annealed.

True brasses contain only copper and zinc, but tin and lead are sometimes added for special purposes. Iron is an impurity and ordinarily considered very detrimental to the alloy. Lead comes as an impurity in the zinc. A high grade of zinc containing not more than 0.07 per cent of lead is used for the best brass. Tin is sometimes added to give greater strength and hardness, and a desired color. Lead is intentionally added to some mixtures to improve the machining.

The sheet brasses vary in proportion from about 60 per cent copper up to pure copper. They differ in color from light yellow to a copper red. An increase in the copper content produces a golden color, while an increase in the percentage of zinc lightens the color of the alloy to light yellow. The cost of brass increases with the percentage of copper.

More than 75 per cent of all wrought brass contains about 65 per cent copper and 35 per cent zinc. There are twelve classifications of commercial rolled brass, including four special brasses shown on our list, and in addition two typical brass rod mixtures.

A wide variety of uses can be made of the standard sheet brasses by selecting the one best suited for a given job, and varying its qualities during the fabricating operations. With a given composition, softness in brass is obtained at the expense of strength and the smoothness of surface when polishing. Likewise, strength and hardness are obtained at the expense of ductility and bending capacity.

7. Gilding Metal.

This alloy contains 95 per cent copper and 5 per cent zinc. It has a reddish gold color. It is the weakest of the brasses and is used for small articles such as bullet jackets, detonator fuse caps, primers, jewelry and small forged parts. It is ductile and easy to work. It may be spun.

8. Commercial Bronze.

This alloy derives its name from its bronze color but is a true brass. It contains 90 per cent copper and 10 per cent zinc. It is very ductile and is much used because of its attractive bronze color.

It is used for stamped hardware, trim, bullet jackets, costume jewelry, bronze caskets, screen cloth, forgings, screws and rivets. It is sometimes also called "Gilding Metal."

9. Rich Low Brass.

So-called because it is low in zinc. Often called red brass. It contains 85 per cent

copper and 15 per cent zinc. It is reddish in color, has fairly good strength and is quite resistant to corrosion.

It is used for so-called "red brass pipe," condenser tubes, jewelry, badges, name plates, etching tags, dials, flexible hose and hardware. A very useful alloy.

10. Low Brass.

Low brass contains 80 per cent copper and 20 per cent zinc and is often called "eighty-twenty." It is quite resistant to corrosion. It has a fine yellow color and is used for ornamental and architectural work, jewelry (for gold plating), clock dials, flexible hose and Fulton bellows. It forms, draws and spins easily.

11. Cartridge Brass or "70-30."

This alloy is made of 70 per cent copper and 30 per cent zinc, the highest grade of zinc being used, and contains practically no lead. Its high ductility makes it a good drawing metal and it derives its name from its use in making deep-drawn cartridge shells. It may be used for difficult drawing or spinning.

It is very useful brass and is used for pins, rivets, eyelets, snap fasteners, radiators, cartridge shells, musical instruments and condenser tubes.

This alloy and alloy No. 12, which follows, possess the best combination of ductility and strength of all the brasses. They may be cold-worked but not hot-worked.

12. High Brass or "2 and 1."

This is the most common commercial sheet brass and contains around 65 per cent of copper and 35 per cent zinc. It is often called "two and one" from the proportions of copper and zinc used. When annealed it is used for deep drawing, general cupping and forming as well as spinning. In the harder tempers it is employed for parts made by blanking, bending and forming.

It is used for ordinary "yellow brass pipe," auto reflectors, radiator cores, springs, screws, grill work, chain and drawn shapes.

13. Leaded High Brass.

This brass contains 65 per cent copper, 33½ per cent zinc and 1½ per cent lead and is a typical leaded brass sheet. The lead improves its machining and punching qualities.

It is formed by bending accompanied by machining and does not draw too well. It is used for kick plates, channel plates, clock and watch backs, lighting fixtures, etc.

A variation of this mixture is "clock brass" which contains 62 per cent copper, 36 per cent zinc and 2 per cent lead. This mixture punches cleaner than high brass. It can be cut and blanked with clean sharp edges and is especially adapted for such parts as clock gears. It will withstand only slight forming and cupping.

14. Free Cutting Rod.

This alloy contains 62 per cent copper, 35 per cent zinc and 3 per cent lead and is a typical brass rod alloy. The lead content makes it machine freely. It can also be extruded. It is used for screw machine parts and extruded shapes.

15. Forging Rod.

This mixture contains 60 per cent copper, 38 per cent zinc and 2 per cent lead and is a typical brass forging alloy. It is used to make hot forgings such as faucet handles, shower heads and miscellaneous forged machine and ornamental parts.

16. Muntz Metal.

This alloy contains 60 per cent copper and 40 per cent zinc. It has fair strength but low ductility. It can be hot rolled and cold rolled and is usually used for making large sheets. It is used instead of high brass (No. 12) on wide sheets if the surface finish is not too important.

It is used for condenser tubes and heads, ship sheathing, perforated metal, brazing rod, valve stems and architectural work.

17. Architectural Bronze.

This alloy contains 56 per cent copper, 41¼ per cent zinc and 2¾ per cent lead and is therefore a brass, not a bronze. It has low ductility and medium strength and high hardness.

It may be extruded and forged and is used for free-cutting extruded shapes, interior ornamental bronze and forgings.

18. Silicon Brass.

This is a comparatively recent alloy and is used for special applications where high strength, stamping and electric resistance welding are requisites. It has low thermal

and electric conductivity, the latter being essential to resistance welding. It is finding a field in the manufacture of refrigerator evaporator shells and fire-extinguisher shells. Quite resistant to corrosion.

19. Aluminum Brass.

This alloy has found increasing application for condenser tubes. It is very resistant to corrosion and erosion and has what is known as a "self-healing" skin.

20. Admiralty Metal.

This is a variation of 70-30 mixture with 1 per cent of tin. It is used primarily for condenser tubes and is quite resistant to heat and salt-water corrosion.

21. Naval Brass.

This mixture is a modification of Muntz Metal with ¾ per cent of tin added. It has good resistance to salt-water corrosion and has many marine applications.

Bronze

22 and 23. Phosphor Bronzes.

These two alloys are typical of a group of phosphor bronzes with tin contents varying from 1.2 to 10 per cent. They have high strength, hardness, resilience and fatigue resistance. They are used for springs, diaphragms, bearings, and miscellaneous small parts. Phosphor bronzes are classed as a refractory alloy. The difficulty of fabricating them makes the cost of manufacture high and consequently their price is relatively high. Some leaded phosphor bronze alloys are good for screw machine work.

24. Silicon Bronze.

This class of copper alloys is an extremely useful one. They contain approximately 96 per cent copper, 3½ per cent silicon and ½ per cent tin or manganese.

They combine high strength and excellent physical properties with a high resistance to corrosion comparable with that of copper. They are non-magnetic, they hot work readily and can be welded by any of the standard commercial methods of gas or electric welding. Their thermal and electrical conductivities are low, the latter facilitating electric welding. They can be cold-worked and when work-hardened can be heat-treated to relieve internal stresses without any sacrifice or either strength or hardness and with a distinct increase in elastic limit. They can be spun, stamped, drawn and forged and are furnished in all standard forms including sheet, rod, tube, shafting, welding rod and ingots for sand castings.

Silicon bronze is used for many applications including corrosion resistant tanks, pressure vessels, bolts, screws, lag screws, chain, pipe fittings, etc. An interesting application of the welding rod is the building up of locomotive driving-box hub faces by the electric welding method.

25. Aluminum Bronze.

These alloys contain from 5 to 9 per cent aluminum and 95 to 92 per cent copper. They are a rich golden color, possess high strength and are very resistant to corrosion. They are quite ductile and can be stamped. Their principal use is for condenser tubes.

26. Manganese Bronze.

This alloy is a modification of Muntz Metal containing 59 per cent copper, 39 per cent zinc, 1¼ per cent iron, ¾ per cent tin and a small amount of manganese. It is hard and resistant to wear. It is used for structural purposes, for grille work, coal screens, forgings and welding rod. It can be extruded.

Nickel Alloys

27. Nickel Silvers.

These alloys consist of various proportions of copper, zinc and nickel. The copper varies from 45 to 75 per cent and the nickel from 2 to 25 per cent. The 5 per cent nickel alloy is yellow and the color grows lighter as the nickel content increases. The 25 per cent mixture is nickel white.

They are resistant to corrosion and resemble silver somewhat in color.

They are used for silver and gold plated articles, extruded shapes, instruments, cutlery and table silver, springs, key stock and interior ornamental bronze.

28, 29 and 30. Cupro-Nickels.

These alloys are straight mixtures of copper and nickel combined sometimes with a small amount of zinc. They are very resistant to corrosion and possess good strength and ductility. Their principal use is for condenser tubes.

Fourteenth Article

Air Conditioning

Construction and Operation of the Standard Air Conditioning Model 559

By W. C. FARMINGDALE

ONE of the outstanding portable room conditioners of this season is the Standard Air Conditioning Model 559, manufactured by the Standard Air Conditioning Corp. Not only does this versatile machine cool, dry and circulate room air, but it also brings in up to 250 c.f.m. of fresh outside air, it will exhaust up to 100 c.f.m. of room air while the cooling machine is operating and it will exhaust up to 310 c.f.m. of room air when the cooling machine is shut off.

By means of a directional discharge grille, the cooled-dried air can be thrown straight up into the room or at any angle down to 45 degrees from vertical. Then, too, inside the discharge air duct are a number of deflecting vanes. These can be set to throw the air to one side of the room, or fanwise. Thus the direction of the air leaving the conditioner can be set so that the entire space is assured of a definite supply of conditioned air.

The velocity of the air leaving the discharge grille is over 1,000 feet per minute. Because of this very high velocity, the conditioned air is carried far into the room and so causes a positive circulation of room air.

All air that passes through this conditioner is filtered by an Arco single phase viscous coated filter located on top of the unit in front of the cooling coil.

The 559 is enclosed in a rich looking cabinet finished in walnut grain. This good looking cabinet is sound insulated so that machinery noise is practically eliminated. The cabinet is made in four sections—the top, the two sides and the front. By a clever arrangement of these pieces no screws show on the front or sides of the cabinet.

With a cooling capacity at standard conditions of 9,050 B.t.u. per hour, the unit is equipped with a ¾ hp. air cooled refrigerating machine. Because of its careful design and its free floating suspension, the machine operates very quietly.

The 559 is equipped with two separate fans. One fan, driven by a 1/20 hp. motor, passes 310 c.f.m. of air through a filter, then through the cooling coil to the room. The second fan is located in the machinery chamber and is driven by the double shafted ¾ hp. refrigerating machine motor. This fan pulls large volumes of outside air through two sections of the condenser and discharges this air to the outside again through a third section of the condenser.

The refrigerating machine is equipped with a double shafted repulsion-induction brush-lifting-type Century motor.

The circulating fan is driven by a 1/20 hp. capacitor start-capacitor run motor. The refrigerating machine motor is protected by an internal thermostat called a "Motor Cop." In case the motor temperature should rise to the danger point, the motor cop will break one of the power supply leads and stop the motor. The motor cop will keep the supply circuit open until the motor temperature drops to a safe level again. This may take from ½ to 1 hour. Because it is of the capacitor start-induction type, the fan motor does not require overload protection. This motor can stand locked rotor current without becoming dangerously hot.

How the Unit Is Built

The air duct that extends between the conditioner cabinet and the window is divided in four sections, as shown in Fig. 1. Condenser fan (D) pulls fresh air through sections (A) and (C) into the machine compartment through the condenser. Then the condenser fan (D) forces this air out of the machine compartment through the condenser into the outside air through duct (B). In passing through the condenser twice, the outside air picks up heat from the condenser and carries it out of the unit.

How Condensate Is Removed from the Unit

Condensate removal is a problem in most air conditioning systems. In the S.A.C. Model 559 the condensate is removed automatically without the use of pumps, collection buckets or injectors. Moreover, the method of con-

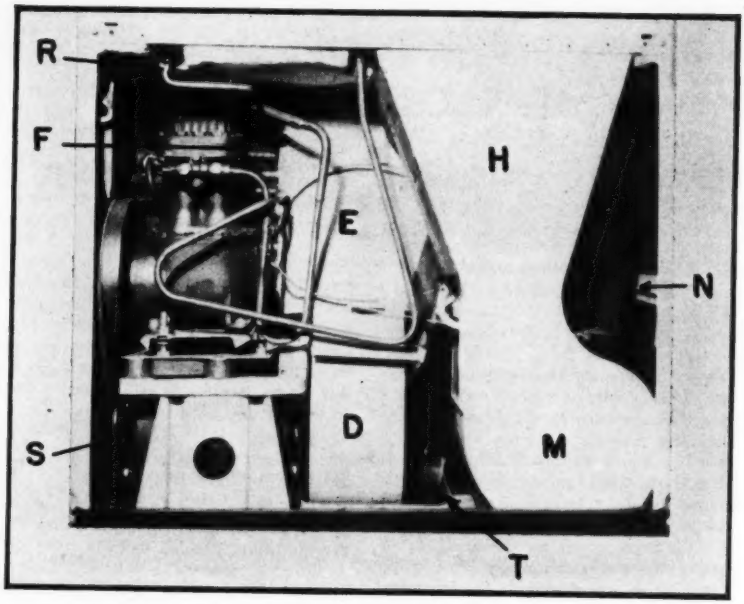
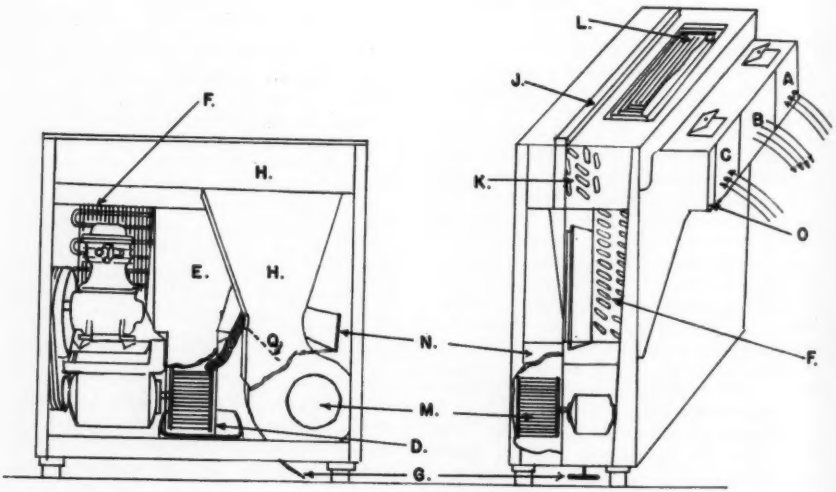


FIG. 1 ABOVE; FIG. 2 BELOW—ILLUSTRATING THE S.A.C. MODEL 539

A—Intake air duct
B—Exhaust air duct
C—Intake air duct
D—Condenser fan
E—Condenser air duct
F—Condenser
G—Room air damper
H—Room air duct
J—Filter
K—Cooling coil
L—Directional grill
M—Room air fan
N—Fresh air damper
O—Fresh air duct
Q—Discharge damper
R—Liquid line to coil
S—Compressor motor
T—Receiver in drain pan



densate removal employed actually increases the capacity of the refrigerating machine.

When warm, moist air is passed over the cold cooling coil, some moisture from the air is deposited on the cold coil. This moisture drops from the coil into the drain pan under the coil and from there it flows through a rubber hose to the condenser fan (D). The condenser fan (D) picks up the water and flings it up the condenser air duct (E) onto the hot condenser (F). Here the water is vaporized and is carried out of the unit through section (B) of the fresh air duct. In vaporizing one pound of water, the condenser gives up approximately 1,000 B.t.u. Hence in the S.A.C. Model 559 the condensate is used to absorb heat from the condenser and increase the overall efficiency of the cooling system.

How Room Air Passes Through the Unit

The room air fan (M) pulls room air from the floor through the damper (G) and discharges this air upwards through the room air duct (H). From here the air passes through filter (J), through the fins of the cooling coil (K), into the room through directional grille (L). In Fig. 2 you'll notice that room air duct (H) extends the width of the unit and thus carries air to the full width of the cooling coil. A number of air deflectors are located at the throat of duct (H) where this duct changes from a vertical duct to a horizontal duct. These deflectors insure an even distribution of air through the fins of the cooling coil and thus make the entire cooling coil do useful work.

Fresh air damper (N) is located directly above the inlet side of the room air fan (M). This damper is controlled by the Bakelite knob to the extreme right of the discharge grille. When this damper is open, the room air fan pulls 60 cubic feet of fresh air through the outside air duct (O) into the fan housing, where it is mixed with room air and carried upward through the room air duct into the filter and cooling coil and then out into the room. The damper control knob is provided with four notches by which the damper can be set in four positions to provide from 0 to 60 c.f.m. of ventilation while cooling is on.

How 100 C.F.M. of Room Air Can Be Exhausted While Cooling Is On

In Fig. 2 you will notice that two small doors are located on top of the fresh air duct directly over sections (A) and (C) of this duct. When these doors are open, condenser fan (D) draws air from the room through these two doors, as well as drawing air from the out-of-doors down through the condenser and discharges this air to the out-of-doors through section (B) of the discharge duct.

With this arrangement of parts the 559 will exhaust up to 100 c.f.m. of room air as long as the cooling machine operates. If the customer desires, the unit can bring into the room up to 60 cubic feet of fresh air each minute and remove from the room 100 cubic feet of stale, used air each minute. In this way, the atmosphere in the room can be constantly changed and renewed. This exhaust feature is particularly helpful in keeping down tobacco odors where occupants of a room are heavy smokers.

Brings in Up to 250 C.F.M. of Fresh Air When Cooling Is Off

So that 250 c.f.m. of fresh air can be brought in while the cooling unit is off, the ventilation lever is placed in the position marked Open. In this position, damper (O) is opened and the floor damper is closed tightly. When the room fan (M) operates, it draws air through sections (A) and (C) of the outside air duct, through the condenser, through damper (O), into the fan housing (M). From here the fresh air is sent upward through the room air duct (H), through the filter (P), through the cooling coil to the room.

This ventilation feature of the 559 makes it a useful machine the year round. It can be used on summer nights to supply cool night air to the room without using the refrigerating machine. It can also be used on relatively cool days during the cooling season to produce comfortable room conditions without operating the refrigerating machine. At other seasons of the year the Model 559 can be used to ventilate the room and to keep the room air circulating continuously.

Exhausts Up to 310 Cubic Feet of Room Air Per Minute

When a large number of persons occupy a room for short periods of time, the atmosphere in a room may become saturated with tobacco odors. With the 559 this atmosphere can be quickly exhausted in the following manner:

The ventilation damper should be set in the exhaust position. When this lever is so set, exhaust damper (Q) rotates upward in the room air duct (H) and closes off this

duct so that air cannot pass up duct (H) to the cooling coil. In this position fan (M) picks up room air from the floor of the room through damper (G) and forces this air out of the unit through damper (Q), through the condenser into the out-of-doors through sections (A) and (C) of the outside air duct.

The Condenser Used on the Model 559

The large cooling capacity of the Model 559 is due in part to the very large finned condenser used in this machine. This condenser is shown in Fig. 3.

The condenser consists of four layers of one-half inch copper tube passed through

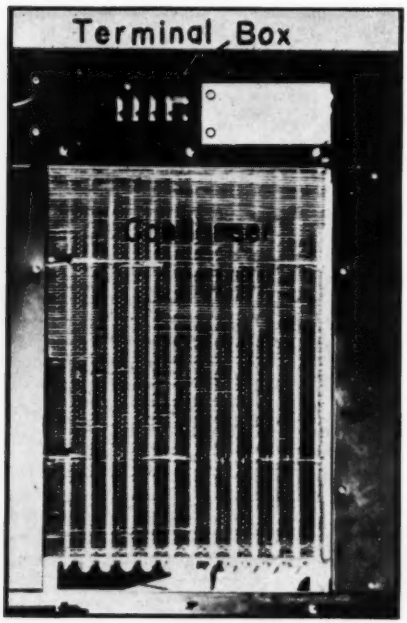


Fig. 3.—Showing condenser and terminal box on S.A.C. Model 559

thin copper fins. These fins are punched to form numerous projections into the space between fins so that the path of air through the condenser is continually changed as the air hits these projections. Thus the greatest possible amount of air comes in intimate contact with the fins and carries heat away from the condenser.

The Sub-Cooler

A sub-cooler is used on the 559 to wring every possible B.t.u. out of the liquid F-12 before it gets to the expansion valve. This further accounts for the high cooling capacity of the 559 system.

The liquid receiver is located in the condensate pan at the rear of the condenser fan and the liquid line zigzags through the condenser air duct before its gets to the expansion valve. Thus the condensate in the pan and in the condenser air duct picks up heat from the liquid F-12.

The Motor Terminal Box

All wires to the motors terminate in a connection box located at the right rear of the unit as shown in Fig. 3. The wires supplied with the 559 are equipped with leads long enough to reach from the motor to the connection box. Hence the serviceman does not have to fuss with motor connections in a cramped space. All connections are very handy to get at.

Motors supplied with a.c. units are of the bi-voltage type; that is, they can operate on either 110 or 220 volts. Because of the handy location of the connection box, a.c. units can be changed over from 110-volt operation to 220-volt operation in a very few minutes.

* * *

The Refrigeration & Maintenance Co., Ltd.
England

Please accept our sincere thanks for your journal, THE REFRIGERATION SERVICE ENGINEER. It is a most excellent book, written by experts and most instructive.

I am passing same to our mechanics, who, I feel sure, will benefit by reading.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

COMMENTS ON QUESTION 271

THE Question Box: In your question No. 271, in the August, 1938 issue, it is asked how the heater element in the 1931 F-12 Frigidaire household unit should be hooked up.

In your answer, you say that the element should be hooked in parallel with the motor circuit. If I interpret this answer correctly, it would mean that the element would only be in operation with the motor. This hook-up is not correct. The element is supposed to keep the oil heated during an off cycle, thereby preventing liquid condensing in the crank case. With the element wired in this way the heater would not serve this purpose.

In all of these models which I have worked on, this heater element was attached to the terminals of the low pressure switch, the action being as follows: when the low pressure switch is in a closed position, the current will flow through the switch and through the motor completing the circuit. When the switch is in an open position, the current flows through this heating element and through the field winding of the motor which completes the circuit. You can see that the motor winding furnishes quite a resistance so that the heater element is not receiving 110 volts.

I believe 110 volts, if fed direct to the heater, would burn it out.

Yours truly,

Willis Stafford, Aurora, Ill.

THE information contained in Question 271, regarding the proper hook-up for this heater element, was obtained from a Frigidaire engineer at the Chicago branch office. While the answer given in the August, 1938 issue did not clearly state this fact, it was intended to convey the information that the element was connected ahead of the pressure switch across the line, so that the heater operated continuously on 110 volts.

If there are any other service engineers who have found the same hook-up, as described by Mr. Stafford, we would appreciate hearing from them.—*Editor.*

USING AMMONIA MACHINE WITH METHYL

QUESTION 274. I have a Parker ammonia ice machine, Serial No. 2040, cylinder 2.5, two-cylinder compressor. I have a customer who is interested in installing a small ice machine for making ice, but prefers methyl chloride, because he does not want to spend so much money for iron coils and other ammonia equipment necessary to make the plant safe. The plans are to build an ice cabinet large enough to hold 20 cans of 50 lbs. capacity each. The cans are about 7"x14"x32".

We would like to know if this machine would handle methyl chloride, the size of tubing best suited for the expansion coils, whether it would be necessary to use two expansion valves, and approximately how many feet of tubing would be ample to take care of a chest approximately 12'x4'x3' deep, reasonably well insulated. Also, approximately the amount of methyl chloride necessary for a charge in this arrangement.

ANSWER: While you haven't given me much information regarding the Parker ammonia ice machine, as to its bore stroke and r.p.m., I have taken what information you have given me, and assumed the rest, and arrived at a probable capacity for this machine.

I find that the machine has a probable capacity of 600 i.m.e. per day, while the load imposed by freezing 1,000 lbs. of ice per day, or 20 cans of 50 lbs. each, will require a capacity of approximately 1,600 i.m.e. per day. Therefore, it will not be possible to use this machine for this particular work.

Ammonia machines can, as a rule, be used with methyl chloride, if properly cleaned and the oil changed.

MAKING AN INSTANTANEOUS WATER COOLER

QUESTION 275. Is it practical to make an instantaneous water cooler by means of a counterflow pipe coil, water to be cooled to 35 degrees at the rate of 200 gallons per hour continuous operation?

The amount of tubing necessary is our stopper. The water will enter cooling coil at 60 degrees and leave at 35 degrees.

If the water is confined to a three or four pass coil of small diameter, the agitation should be greater and figure in the "K" of the coil, should it not?

Will the water pressure effect the freezing point? It is 60 pounds pressure at the main.

What is the lowest refrigerant temperature that it would be safe to go with this type coil to prevent freeze-ups?

How can one figure the required cooling surface necessary?

ANSWER: I believe it is entirely practical to make an instantaneous water cooler of the counterflow type. However, the rate at which you want to cool water is going to require considerable refrigeration. At eight lbs. per gallon you are cooling 1,600 lbs., through a temperature difference of 25 degrees. This will give us a cooling load of 40,000 B.t.u.'s per hour or somewhat over three tons of refrigeration. With the flash type cooler it may be possible to maintain refrigerant temperatures approximating 33 degrees to 35 degrees and under these conditions we should be able to obtain very close to one ton of refrigeration per h.p., provided our cooling water is available at a comparatively low temperature. It would probably be safest to use a five h.p. machine.

In looking up some tests on the rate of heat transfer from refrigerant through copper tubing, I find that with ¼ inch O.D. tubing we get a heat transfer of 375 B.t.u.'s per square foot of internal surface per hour per degree difference in temperature between evaporating refrigerant and violently agitated water on the outside of the tubing. With ⅜ inch tube this heat transfer dropped to 275.

I believe a safe figure to use would be approximately 150 with refrigerant tubes not exceeding ½ inch in outside diameter. To provide over three tons of refrigeration will require more than ½ inch suction lines and evaporator coils so I would suggest that a number of evaporator coils might be used in parallel so as to provide not more than ¾ ton of refrigeration for each ½ inch evaporator tube. The number of tubes can be taken into consideration and the total amount of heat transfer surface calculated from the above factor and the length of the various coils determined.

I would suggest the use of separate valves on each coil with all the coil outlets being connected to one main suction line passing back to the condensing unit. The diameter of the water tube should be such that the water is confined to within ⅛ inch maximum distance from the refrigerated surface. This will give a fair rate of agitation giving us a high "K" factor. The pressure of the water will not affect this freezing point. I would say that 33 degrees is surely the lowest temperature it would be practical to go with the refrigerants. Probably a suction line throttling valve set to maintain a minimum temperature of 33 to 34 degrees would be the most suitable method of regulating temperature.

CURRENT CONSUMPTION OF MOTORS

QUESTION 276. I have been trying to convince some of my prospects that mechanical refrigeration is cheaper than their present method. I can figure the complete cost of the equipment, but when it comes to figuring the cost of electrical consumption, I am unable to find the correct formulaes.

How can I figure the wattage consumption of any horsepower motor, and arrive at the hourly running time cost of current consumption. Is there any company I can write to to obtain these formulaes?

ANSWER: In order to answer your question, we will assume we have a 1/16-hp. motor, such as used on the smallest Frigidaire Meter-Miser unit.

Referring to tables, we find that 1-hp. is equal to 746 watts per hour. This figure, of course, is theoretical, and does not take into account the loss of efficiency, and since most motors are only about 70 percent efficient, we will, therefore, have to add 30 percent to this quantity to get our actual electrical consumption per horsepower, which will then become 1.30 × 746, which equals approximately 970 watts. 1/16 of this amount, which would be the consumption per hour for 1/16-hp., would be approximately 60 watts.

There are 30 × 24 hours, or 720 hours per month, in which the machine will have to refrigerate, and since it will run only about 25 percent of this time, our total running hours will, therefore, be 25/100 of 720, which equals 180 hours per month. Multiplying this by our watts per hour, we obtain 60 × 180, which is 10800 watts or 10.8 kilowatt hours per month. From the local electrical company, you can obtain the cost per kilowatt hour, and if we assume this to be 5½c, our cost then becomes 10.8 × 5.5, which equals 59.4c per month.

The whole matter can be boiled down to a simple formula, which could be stated as follows:

$$\frac{1/16 \times 746 \times 1.3 \times 180}{1000} = \frac{174.5}{16} = 10.9$$ kilowatt hour per month.

SERVICING A MILLS FREEZER

Question 277. I serviced a Mills ice cream freezer and hardener, and I would appreciate some information. The liquid is carried from the receiver to the expansion valve of the mixer. Immediately after passing through this valve, it is evaporated in the mixer coil, and there is a tee which carries it also in ¼-inch tubing to the expansion valve of the hardener coil. The two suction lines tee together, and return to the compressor. Why do they wait until the liquid has passed through mixer coil expansion valve before carrying it to the expansion valve of the hardener coil?

There is a hand valve in the suction line of the mixer, which is closed when the mixer is not being used. When the machine is running and the mixer is not being used, what keeps the liquid from accumulating in the coil of the mixer, and then when the mixer is used, the hand valve in the mixer suction line is opened, and it looks to me like some liquid might return to compressor. It seems to me that running a separate liquid line to each expansion valve would have been all right.

There is a valve of some kind connected between the mixer coil adjacent to expansion valve and the highside of the compressor. I assume this valve will relieve excessive pressure, and let it pass back into highside when the mixer is being washed with hot water. It is pressure-operated, has check valve in suction line of hardener, and switch is set to control temperature of hardener.

Answer: The hook-up you describe of the Mills ice cream freezer is indeed a peculiar one, and would appear at first sight as though it would not work properly.

However, this is not the case, and any attempt to connect it in any other manner would most certainly meet with difficulty. The purpose of this particular type of hook-up is to permit the oil to drain properly from the freezer, or mixer coil. When the freezer is shut off, only the suction line contains the shut-off valve, and as soon as this section warms up, the thermostatic valve will be in a full open position, permitting the gas to pass through it to the second expansion valve on the hardening coil. The freezer coil then becomes a part of the highside containing high pressure gas. Some liquid, of course, will accumulate at this point, but not sufficient to cause any slugging since the high pressure gas will act as a trap, and will allow only a small amount of liquid to enter. The quarter-inch line returning to the compressor from the "T" contains a check valve, which as you surmised, is for the purpose of relieving any high pressure that may accumulate in the freezer coil while it is shut off.

PROPERTIES OF CARRENE

Question 278. I am writing you concerning information offered by your Service Department. I desire information about the refrigerants Carrene and sulphur dioxide, particularly about servicing units using these refrigerants, problems of construction and design encountered and thermodynamics.

Answer: With respect to the thermodynamic properties of Carrene and sulphur dioxide, I am listing below the pressure temperature relationships of these two refrigerants. The temperature indicated in the left-hand column is the temperature that will exist at the surface of a liquid and vapor at the pressures indicated in the other columns.

With respect to other thermodynamic properties, if we consider the liquid refrigerant as entering an expansion valve at 80 degrees temperature and evaporating at

Temperature at Surface of Liquid and Vapor—Degrees F.	Vapor Pressure	
	Sulphur Dioxide	Carrene
—10	13.9*	28.1*
0	8.8*	27.5*
10	2.6*	26.7*
20	2.4	25.6*
30	7.0	24.3*
40	12.4	22.6*
50	18.7	20.7*
60	40.9	18.2*
70	49.6	15.1*
80	59.7	11.5*
90	71.2	7.3*
100	84.5	2.4*
110	99.8	1.6
120	120.9	4.7
130	136.5	8.4
140	158.6	12.4

* Inches of vacuum. Others not marked are in pounds per square inch.

a temperature of 10 degrees we will have to circulate approximately 63 cubic feet of Carrene per minute per ton of refrigeration for 24 hours. For sulphur dioxide operating under the same conditions we would circulate 7.9 cubic feet. These figures compare to 5.5 cubic feet per minute for methyl chloride and 5.1 cubic feet per minute for Freon.

The effective refrigeration under these conditions is 136 B.t.u.'s per pound of Carrene as compared with 144 B.t.u.'s per pound of sulphur dioxide, 153 B.t.u.'s per pound of methyl chloride and 53 B.t.u.'s per pound of Freon. Carrene operates on a very low suction pressure and with a high pressure at approximately atmospheric pressure. This means that Carrene may not be handled as the other refrigerants which exert a positive pressure at normal temperatures, so that Carrene may be carried around by the serviceman in an ordinary can.

In general Carrene is used in connection with high-side floats or capillary tubes and if air leaks into the system it may be purged out from the high-side float chamber or out of the evaporator in the capillary tubing system, provided that the whole machine and evaporator are warmed up to a temperature above 100 degrees.

The Typical Air Conditioning Job and the Service Man

Second Article—Continued from the August Issue

By W. S. BODINUS *

Example 5

GIVEN: Wet Bulb Temperature, 55 degrees; Dew-Point, 50 degrees. Find Dry Bulb Temperature and Relative Humidity.

Locate the point of intersection of the oblique line representing 55 degrees Wet Bulb Temperature with the horizontal line representing the Dew-Point of 50 degrees.

Reading vertically downward from this point to the Dry Bulb Temperature scale, the Dry Bulb Temperature is indicated as 61.5 degrees, and by interpolation, the Relative Humidity is indicated as 67 percent.

Example 6

Given: Relative Humidity, 40 percent; Dew-Point, 40 degrees. Find Dry Bulb Temperature and Wet Bulb Temperature.

Locate the point of intersection of the curved line representing 40 percent Relative Humidity with the horizontal line intersecting Curve A at 40 degrees Dew-Point Temperature.

Reading vertically downward from this point to the Dry Bulb Temperature scale, the Dry Bulb Temperature is indicated as 65 degrees, and reading obliquely upward to the left, along the Wet Bulb Lines, to Curve A, the Wet Bulb Temperature is indicated as 52 degrees.

The Total Heat of air is composed of the sensible heat, or heat due to the temperature of the air as indicated by the thermometer, and the latent heat, or heat of vaporization of the moisture or vapor in the air. The Total Heat is a constant quantity for any given Wet Bulb Temperature, irrespective of any change in the Dry Bulb Temperature. This fact has been termed by W. H. Carrier:* "One of the four fundamental psychrometric principles." In the chart, the Total Heat is shown, for the sake of convenience, as above zero degree Fahrenheit. Furthermore, Total Heat, as here used, does not include the sensible heat of the liquid nor the latent heat of fusion. It is assumed that the water evaporated is initially at the Wet Bulb Temperature.**

To find the Total Heat the Wet Bulb Temperature must be known. Find the point on Curve A which corresponds to the given Wet Bulb Temperature. Read vertically (upward or downward) to the

* Engineer, Carrier Corporation. Reprinted from paper delivered at 4th Annual Convention R.S.E.S., Chicago.

* "Rational Psychrometric Formulae," Trans. Am. Soc. Mech. Engrs., 1911, Vol. 33, p. 1005.

** See, Temperatures of Evaporation, Carrier & Lindsay—Trans. Am. Soc. Mech. Engrs., 1925, Vol. 46, Append. No. 1, p. 763.

Curve C, "Total Heat above Zero Degrees contained in One Pound of Dry Air saturated with Moisture." Then read horizontally to the left to the scale C.

Example 7

Having air at a Wet Bulb Temperature of 70 degrees and air at a Wet Bulb Temperature of 61 degrees, find the difference in Total Heat between a mixture containing one pound of dry air and the quantity of moisture present at the Wet Bulb Temperature of 70 degrees: and a mixture containing one pound of dry air and the quantity of moisture present at the Wet Bulb Temperature of 61 degrees.

The quantity of moisture present at any given Wet Bulb Temperature will, of course, vary with the existing Dry Bulb Temperature. Since the Total Heat is a function of the Wet Bulb Temperature, irrespective of the Dry Bulb Temperature the quantity of moisture present does not affect the Total Heat so long as the Wet Bulb Temperature does not change.

Note that this Chart deals with a mixture containing one pound of dry air *plus* the amount of moisture present under the given conditions. In no instance does the Chart contemplate a pound of mixture (air and moisture together), but always a mixture containing one pound of dry air.

Find the point on the Wet Bulb Temperature scale corresponding to 70 degrees. Read vertically upward to the Curve C. From this intersection read horizontally to the left to the scale C, which indicates the Total Heat (above degrees F.) as 33.5 B.t.u. Repeat this procedure to ascertain the Total Heat at the Wet Bulb Temperature of 61 degrees, which is indicated as 26.7 B.t.u. Then, subtracting, 33.5—26.7 =6.8 B.t.u., which is the difference in Total Heat.

This procedure is used in engineering calculations to ascertain the heat to be removed in cooling from one condition to another.

To find the resulting Relative Humidity when heating or cooling air without changing its Dew-Point.

Find the Dew-Point for the given conditions, which is the horizontal line through the point of intersection of the vertical Dry Bulb line with the oblique Wet Bulb line Follow this line horizontally to the new Dry Bulb Temperature line and read the percentage of Relative Humidity for this point of intersection.

Example 8

Given: Dew-Point 70 degrees; and Dry Bulb, 80 degrees. Find the Relative Humidity if the Dry Bulb Temperature is increased to 90 degrees, the Dew-Point Temperature remaining constant.

Locate intersection of vertical 80 degrees. Dry Bulb line, with horizontal 70 degrees Dew-Point line. From this point read horizontally to the right to the vertical 90 degrees Dry Bulb line and at this intersection interpolate for the percentage of Relative Humidity, which is indicated as 52 percent.

Example 9

Given: Dry Bulb Temperature, 70 degrees; Wet Bulb Temperature, 60 degrees. Find the Resulting Relative Humidity when air is heated to 80 degrees (Dry Bulb Temperature).

The point of intersection of vertical 70 degrees Dry Bulb and oblique 60 degrees Wet Bulb lines indicates an existing humidity of 50 percent. Reading horizontally to the right from this point to the intersection with the vertical 80 degrees Dry Bulb line the resulting Relative Humidity is indicated as 40 percent.

Vapor Pressure in inches of Mercury depends upon the Dew-Point and is represented by horizontal lines with values indicated on the scale D, "Vapor Pressure in Inches of Mercury."

To determine the Vapor Pressure read horizontally from intersection of vertical Dry Bulb line with oblique Wet Bulb line, to Curve A and vertically, to the intersection with the "Vapor Pressure" curve D; then horizontally to the left to the scale D.

Example 10

Given: Dry Bulb Temperature, 80 degrees; Wet Bulb Temperature, 70 degrees. Find the Vapor Pressure.

Find the point of intersection of the vertical 80 degrees Dry Bulb line with the oblique 70 degrees Wet Bulb line. From this point read horizontally to the left, to curve A. (Dew-Point is indicated on this scale as 65.5"). From this second point read vertically to Curve D. From the vertical intersection with Curve D, read horizontally to the left to Scale D, where the Vapor Pressure is indicated as 0.63 inches of Mercury.

Absolute Humidity (Grains of Moisture per Cubic Foot)

Absolute Humidity is a function of the Dew-Point and may be expressed either in grains per pound of dry air in the mixture, or in grains per cubic foot.

The grains of moisture per pound of dry air in the mixture are represented by horizontal lines with values indicated on the Scale A, "Grains of Moisture per pound of Dry Air." To find the grains of moisture per cubic foot for air under given conditions, first determine the grains per pound of dry air in the mixture, by finding the intersection of the vertical Dry Bulb line with the oblique Wet Bulb line and reading from there horizontally to the left to scale A, "Grains of Moisture per pound of Dry Air."

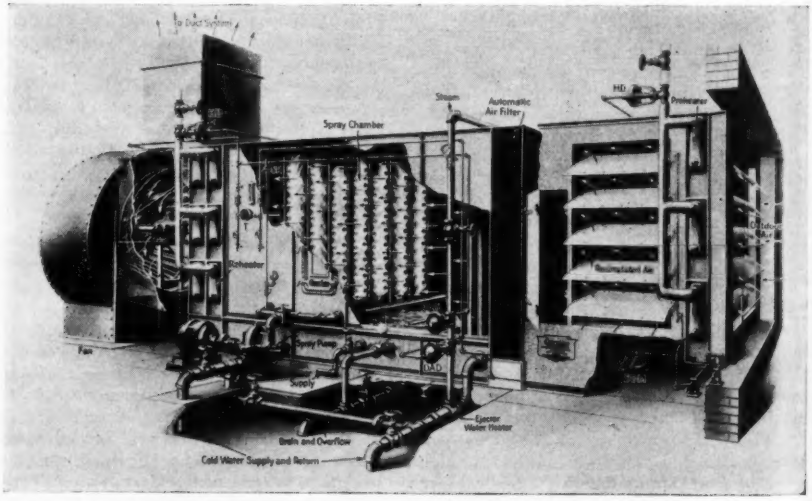
The volume in cubic feet per pound of dry air is represented by horizontal lines with values indicated on scale B, "Cubic Feet Per Pound." Find the points of intersection of the vertical Dry Bulb Temperature line with the curves B, "Volume in Cubic Feet of One Pound of Dry Air Saturated with Moisture" and "Volume in Cubic Feet of One Pound of Dry Air." From these points read horizontally to the left to the Scale B, where the values are shown. The difference in the two volumes is the increased volume of the mixture, due to the presence of the moisture at 100 percent Relative Humidity.

To determine the volume of an unsaturated mixture, multiply the difference between the two B curves by the percent. Relative Humidity. Add this result to the volume of one pound of dry air at the same temperature.

Then the grains of Moisture per cubic foot of this mixture, i.e., the Absolute Humidity, is the Grains of Moisture per Pound of Air, as determined for the given conditions on Scale A, divided by the volume which has been determined for one pound of the mixture.

The Estimator

The engineering data having been completed the documents are turned over to a price Estimator who applies the most economical arrangement of refrigerating equipment and Weathermaker apparatus to the problem and proceeds to prepare the price estimate. This estimate will include many manufactured items as well as contract work such as piping, sheet metal, insulation, erection, etc. The Estimator should from experience realize the necessity of obtaining prices on each of the equipments and subcontracts from good reliable and well established sources. How often has a poorly constructed sheet metal job prevented the air from being properly distributed, or a cheap



A TYPICAL CENTRAL STATION AIR CONDITIONING UNIT.
Showing the spray chamber, the automatically controlled air dampers, the heaters, the Auxiliary air filters and the centrifugal fan.

kind of insulation wasted away much of the refrigerating effect, or unskilled hands used in the installation of the special piping for air conditioning jobs. This has caused one of the greatest service problems—gas leakage—a hazard as well as a most difficult problem to the Service Man for without adequate gas charge not even the simple basic control settings can be made. Thus the price estimate and subcontract dealings affect the Service Man and a correctly made estimate allows the Service Man to do his work faster and to give his employer a satisfied customer.

The Contract

This little document with its specification is the legal agreement between Buyer and Seller and should be a complete resume of all understandings between the two parties. This should contain a description of the problem and the scope of work to be done, a description of the equipment in specification form, so that the Service Man and owner can readily identify same. A guarantee of conditions to be maintained together with its limitations as to people occupying space, lights, etc. and of course a price and terms of payment. The Contract is the guide of the Service Man to make his adjustments and to check the installation so that all parts agree with the specifications. Of course a Contract is only as good as the parties that sign it and the faith which the two parties place in one another. The Service Man may be called upon to interpret the contract if the purchaser may be excessively unreasonable in his demands. If the air conditions to be maintained are clearly established in the Contract the Service Man can regulate himself accordingly.

The Installation

This is the step immediately preceding the Service Man's appearance on the job and generally is the first direct contact of the buyer with the seller. The manner in which the installation is made makes a lasting impression upon the buyer and establishes his opinions of the people he is doing business with. A well planned installation procedure is vital, as well as prompt, courteous delivery of materials and clean workmanship with as little inconvenience to the buyer. In order to make the installation work as least objectionable as possible, many companies provide their workmen with clean overalls weekly or more often if necessary. The price estimate and the installation go hand in hand and a thorough coordination of both will make the job so much more satisfactory and the Service Man's work easier and more profitable to his employer.

The Service Man

The Service Man appears on the job with little knowledge of what has gone on before, a handful of papers in one hand, his kit of tools in the other, and a job to finish. He must inspect the installation as a whole and see that the contract is fulfilled, check the blue prints against the installation, and in general get acquainted with all that has gone on before in as little time as possible. This calls for a keen mind, liberal education, experience, nerves and a sound healthy body on the part of the Service Man. He must make the necessary pressure tests for tightness and safety of the refrigeration equipment. He must fill the system with its necessary ingredients such as water, oil, gas, brine and electricity. Again a check for safety, defects, and tightness and then to put the system into regular operation. Special care and attention is necessary at this point since the control system has not been tested or adjusted and a false step at this time might freeze up the equipment, overcool the conditioned space, or cause drafty conditions. The Service Man should adjust the temperature control as fast as possible after the space has been brought down to temperature, then to balance the air, adjust air outlet, and provide the proper amount of outside air. Finally he must instruct the owner or his engineer in the proper operation of the system and to prepare written instructions to insure its continuous and most efficient operation.

Conclusion

Thus the Service Man takes his place in the typical air conditioning job and certainly his job is one of considerable responsibility. He must be a politician, salesman, engineer, estimator, lawyer, contractor, and service man. His work is final and what he does can make the job profitable for his employer and at the same time give the purchaser an installation he can be proud to own. We can say without reservation that the Service Man's part in this fast moving game of Air Conditioning is most important and without the right kind of service and without well trained Service Men the air conditioning industry cannot continue to prosper.

(Concluded)

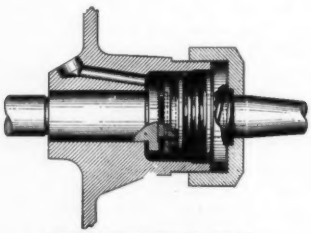
NEW MECHANICAL DEVICES
Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer. Information contained in this department is furnished by the manufacturer of the article described and is not to be construed as the opinion of the Editor.

UNIVERSAL COOLER CORPORATION DEVELOPS NEW COMPRESSOR SEAL

AN improved and simplified replacement seal (Part No. 82407) has recently been developed by Universal Cooler Corporation, Detroit, Michigan, for use in their models B-C-D-E and F compressors, which combines new efficiency, reliability, and economy with easy installation.

This new seal is of the bellows type construction, which insures the necessary flexibility to compensate for crankshaft movement due to pressure fluctuations, and permits the continued use of the piloting location originally designed into the compressor crankcase. Thoroughly engineered,



NEW UNIVERSAL SEAL.

painstakingly built, and carefully inspected, it is manufactured of the finest materials.

The seal nose is made from a high grade alloy which is noted for its ruggedness, fine grain composition, and ability to take a fine finish. The seal ring is machined from a super-hard steel, also having a very fine grain and capable of taking a mirror-like polish. The seal ring gasket is molded from Neoprene and confined within the steel seal ring. All seals and seal bearing rings are subjected to an optical flat inspection.

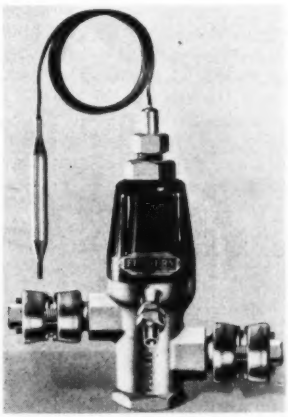
As a result, the new Universal Cooler replacement seal not only stands out as an engineering achievement, but also provides the customer with years of trouble-free service, and insures the service man a minimum of repeat, or no-charge, calls.

NEW MODEL 37 VALVE INTRODUCED BY FEDDERS MFG. CO.

A NEW Model 37 high capacity thermostatic expansion valve built in capacities up to 20 tons for Freon and 44 tons for methyl, for use in larger commercial refrigeration and air conditioning systems, is announced by Fedders Manufacturing Co. of Buffalo, N. Y.

The valve follows the general design of the popular Model 33 thermostatic expansion valve but is larger not only in capacity but in size of working parts and refrigerant passage ways.

It has the exclusive interchangeable power bellows and bulb assembly which provides



FEDDERS MODEL 37 VALVE.

convenience and economy both in stocking valves for various refrigerants, various tube lengths and for simplifying and facilitating service work.

The valves are easily adjusted by means of a convenient adjusting nut located at the top of valve. The adjustment as well as the operation of the valve is sensitive and makes it possible to balance the system and obtain the most effective and economical perform-

ance throughout the entire installation.

Power element and valve are operated by hydraulically formed bellows having an ample number of convolutions to provide long life.

The use of bellows type construction makes it possible to use a high vapor charge in the power element and permits thorough and absolute dehydration in electrically heated ovens.

A 28-inch vacuum is applied to the interior of the valve during hydration, thus lowering the boiling point and assuring complete vaporization and removal of every trace of moisture.

The power element is insulated from the valve proper by means of a moulded push pin. Moulded power element housing is hermetically sealed, providing protection against freeze-ups.

The body of the valve is heavy drop forge brass of dense homogeneous metal structure. This provides insurance against seepage leaks under high working pressure.

Valve is equipped with connection flanges with tail pipes for sweating refrigerant lines, ranging from 3/8 inch O.D. to 7/8 inch O.D. on inlet and 5/8 inch O.D. to 1 1/8 inch O.D. on outlet. Valve body has 1/2 inch female pipe tap inlet and 3/4 inch female pipe tap outlet, for use where sweat fittings are not desired.

The valve is equipped with a connection for an equalizer tube.

Complete information and data are available in Bulletin 388 by writing Fedders Manufacturing Co., Buffalo, N. Y., or their branches.

S S S

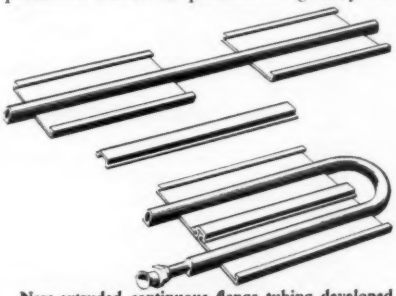
EXTRUDED COOLING COIL GIVES HIGH EFFICIENCY AT LOW COST

BY an ingenious method of using continuous extruded flanged tubing, the Bohn Aluminum and Brass Corporation in cooperation with the Universal Cooler Corporation has developed a cooling coil having a number of important advantages. Since the tube for the refrigerant is integral with the flange forming the cooling surface the heat transfer efficiency is at a maximum in contrast with the usual losses where the coil is assembled from separate units placed in contact with each other.

Because of the methods used in forming the coil by bending the extruded tube and flange into a continuous unit, the cost of manufacture is greatly reduced through the saving of parts, material and labor.

Considerable weight is also saved by the use of the continuous strips of extruded flanged tubing. The strips are bent to form the tube in a 180 degree arc at the extremities of the coil as shown in the illustration. The flanges are brought into parallel contact with each other and locked together with a metal clip in such a way that a continuous flat surface is formed on the inside or cooling surface. This flat surface can in turn be formed to make the supporting element for ice-cube tray shelves, etc.

In contrast with the usual construction which is only suitable for extremely low pressures of perhaps 25 pounds to the square inch, the new coil has been tested without sign of breaking, bulging or other form of distortion up to as high as 2800 pounds per square inch. This ability to withstand high pressures makes it possible to greatly increase the number of uses for which the coil is suitable. It can be employed, for instance, in the manufacture of steam tables operating under a high pressure head just as readily as for low pressure circulation of a refrigerant.



New extruded continuous flange tubing developed by Bohn Aluminum and Brass Corporation which has wide range of uses in refrigeration and other fields where heat or cold are transferred from liquid in a tube to a flat surface.

For use in the manufacture of evaporators of large sizes the extruded strips of flanged tubing are available in lengths up to 80 feet or more. In lengths over 21 feet the flanged tubing is supplied in coils. The material employed is an aluminum alloy particularly adapted to the purpose. The evaporator thus formed is a complete one-piece unit. At the terminals of the aluminum tubing, copper tube is welded to take the pipe unions used to connect the evaporator with the refrigerant supply lines and if flared union connections are undesirable, the copper ends permit the practice of silver soldering or brazing to headers or supply lines.

Announcing **FEDDERS MODEL 37**

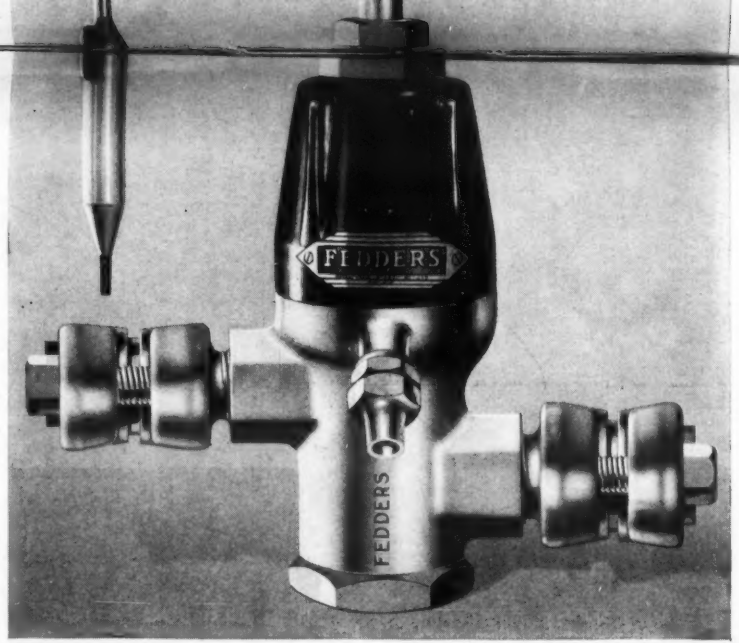
HIGH CAPACITY

THERMOSTATIC EXPANSION VALVE

8-12-16
20 TONS
CAPACITY
FREON

Designed for use on air conditioning and large commercial refrigeration systems, their sensitive operation provides accurate, dependable control of the amount of refrigerant entering the coil.

Convenient adjustment makes it easy to balance the system for the most effective and economical performance. Exclusive interchangeable Power Element Bellows and Tube Assembly provides convenience and economy in stocking valves for various refrigerants



Showing valve with flanges for sweating connections. Equalizer Tube Connection is standard equipment.

U.S. Pats. No. 1,974,631; 1,978,948; 2,011,379

Convenient adjustment makes it easy to balance the system for the most effective and economical performance. Exclusive interchangeable Power Element Bellows and Tube Assembly provides convenience and economy in stocking valves for various refrigerants and tube lengths, and in service work.

Bellows formed under hydraulic pressure assures uniform metal thickness and long life. Vapor Charged Power Element results in positive, sensitive control throughout the entire range of working temperatures. Bellows type design makes it possible to absolutely dehydrate the valve.

Power Element Assembly is hermetically sealed for protection against freeze-ups. Moulded Push Pin provides thermal insulation between valve proper and power element.

Heavy drop forged brass Valve Body eliminates seepage leaks.

Write for Bulletin 388

FEDDERS MANUFACTURING CO.
BUFFALO, N. Y.
Please send complete data on Model 37 High Capacity Thermostatic Expansion Valve.
Name.....
Concern.....
Street.....
City..... RSE9

FEDDERS
MANUFACTURING COMPANY
BUFFALO, N. Y.

Atlanta, 175 Luckie St., N. W. Dallas, 209 S. Pearl Street
Boston, 712 Beacon Street Detroit, 1036 Beaubien St.
Chicago, 112 N. Green St. Los Angeles, 1501 W. Eighth St.
Cincinnati, 305 E. Sixth Street New York, 114 E. 16th St.
Philadelphia, 2100 Arch Street

ARE YOU GETTING YOUR COPY OF THE FEDDERS NEWS?

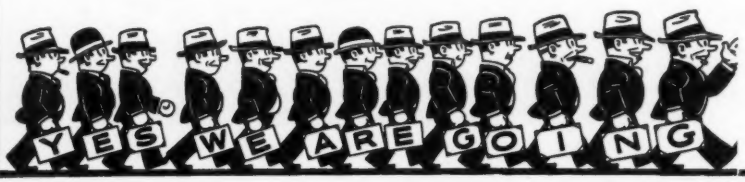
for Buffalo 5th Convention and Exhibition

The REFRIGERATION SERVICE ENGINEERS SOCIETY

EVERY man interested in the installation and servicing of domestic and commercial equipment owes it to himself to be in Buffalo, November 2-4. *This is the service engineers' own convention.* Come for the practical information you can learn, and the opportunity of seeing and hearing of the trends as they affect your business.

It will be well worth your time. The meetings will be inspirational, and will return you to your work with new ideas to carry on for a more profitable business.

Accommodations to fit every purse are available in Buffalo. This convention provides an intensive 3-day educational program, as well as the opportunity to relax and meet with other men from all points. Plan to spend the entire week in Buffalo attending the convention and seeing the many interesting sights that Buffalo offers to the visitor.



Educational Informative Entertaining

EDUCATIONAL PROGRAM—A practical educational program arranged to discuss the problems that are of the utmost importance to you in your business—bringing news of the latest developments. Here the "top-notchers" in their respective fields bring you information that will enlighten you on the practical side of your business.

MANUFACTURERS' EXHIBIT—See the exhibit of the manufacturers, who are interested in your problems who will show the operation and application of their products. This exhibit in itself presents a real opportunity to learn more about the products you are using every day.

ENTERTAINMENT—Enjoy the social events that have been planned especially for you—the contacts with other service engineers from all parts of the country. You will remember your trip to Buffalo for a long time.

Be Sure to Bring the Ladies

They will enjoy the convention as much as you, and the events planned especially for them will keep them occupied throughout the entire convention.

Make your plans to meet with the other progressive service engineers in Buffalo, November 2-4!

S S S

PROPOSED CHANGES TO CONSTITUTION AND BY-LAWS

September 1, 1938.

To the Members:

Pursuant to the provisions of the Constitution and By-Laws of the Refrigeration Service Engineers Society, providing for amendment, the following two proposals will be referred to the 5th Annual Convention, to be held in Buffalo, November 2-4, 1938, for suitable action.

A proposal to amend ARTICLE VI (Membership) of the Constitution, to provide for an additional membership classification as follows:

Change Section 1, ARTICLE VI, to read: "This Society shall be composed of five classes of membership: certificate, active, associate, *junior* and honorary members."

Change Section 5 to Section 6, and substitute a new Section 5 as follows: "A junior member is one who is at present a student of refrigeration, or who, for various reasons, cannot qualify at present as an active or associate member. He will be entitled to all of the privileges and literature of the Society, with the exception of voting privileges, or a membership certificate or card. He may apply for transfer to active membership at any time he can qualify."

Proposed change to ARTICLE V (Privileges of Members) of the By-Laws, as follows: "At annual and special meetings of the National Association, each Chapter shall be allowed one voting delegate and one vote to *every* member in good standing upon whom the National per capita tax has been paid. No member shall be permitted to vote by proxy unless he shall give prior notice, accompanied with an affidavit showing his inability to attend, which notice shall be filed with the National Secretary on or before ten days prior to any general or special election of officers or directors."

H. T. McDERMOTT, *National Secretary*

New Chapters Formed at Denver, Colo., Springfield, Mass., Nashville, Tenn.

SPRINGFIELD, MASS.

ON August 10, through the courtesy of Mr. Carl Payson, a group of refrigeration servicemen of Springfield, Mass., met at the store of the C. P. Payson Co., refrigeration jobbers, to consider the formation of a local chapter. Mr. H. T. McDermott, National Secretary, was in attendance to explain the purposes and objects of the National organization, and the benefits to be secured from a local chapter. The following refrigeration service engineers signed the application for charter:

Geo. F. Allen	Wm. B. Kenyon
M. H. Averson	Charles Langone
R. Blanchard	Joe Maruca
F. T. Bushuyzen	Bruce Orlow
Geo. Chevrier	Harold Ouimet
F. Connelly	Carl Page
E. Crafts	Errol Putnam
L. A. Desotell	Allen Quimby
Wm. J. Foley	W. E. Quimby
Don George	C. J. Roberts
A. Godin	J. F. Rogers
Paul Hammond	Irving Trombley
Art Hebert	James Vye
Frank Kaspar	

Mr. Frank Kaspar, of W. W. Murphy Co., was elected Temporary Chairman, Mr. L. A. Desotell was elected Temporary Secretary, and Mr. W. E. Quimby, of Frigidaire, was elected Temporary Treasurer. Several committees were appointed by Mr. Kaspar, including: Membership Committee, comprising Mr. Harold Ouimet, Mr. James Vye, and Mr. A. J. Godin; Publicity Committee—Mr. M. H. Averson; Housing Committee—Mr. Paul Hammond, Mr. William Kenyon, Mr. W. E. Quimby.

Subsequent meetings have been arranged to complete the details of the formation of this chapter, and service engineers in the vicinity of Springfield, desiring to affiliate with the local chapter, are requested to communicate with Mr. L. A. Desotell, temporary secretary, at 365 Dickinson St., Springfield, Mass.—phone 3-5497.

MILE HIGH CHAPTER, DENVER, COLO.

AT a meeting on July 21, which was held in the offices of the Refrigeration Parts and Supply Co., through the courtesy of Mr. Harold R. McCombs, an application for charter for a local chapter, to be known as Mile High Chapter, was signed by the following refrigeration service engineers:

Geo. H. Gorman	Leonard W. Martin
Jas. L. Taylor	John K. Lind
Thos. C. Alexander	A. H. Ward
A. C. Darby	Bill Steininger
Tom C. Montgomery	James J. O'Connell
Ernest Martin	

Temporary officers, elected until the charter is formally presented, include: John K. Lind, *Temporary President;* Albert H. Ward, *Temporary Secretary;* Charles A. Lawton, *Temporary Treasurer.*

Denver has a progressive group of refrigeration service engineers, whose purpose will be to make this chapter one of the outstanding organizations for service engineers in the Rocky Mountain District. Service engineers, who are interested in affiliating with the chapter in the jurisdiction of this local association, are invited to communicate with Mr. Albert H. Ward, temporary secretary, 4661 Lincoln St., Denver, Colorado.

NASHVILLE, TENN.

AT a meeting, called by Mr. J. B. Thomas, of The Starr Co., 1602 West End Ave., Nashville, Tenn., on August 26, an application for charter, signed by the following service engineers, was forwarded to the National Secretary's office:

J. B. Thomas	W. P. Austin
W. E. Nance	K. G. Womack
Paul E. Spright	Carl B. Mason
R. M. Swan	H. G. Hembee
Joe Slate	P. J. Dibble
Robt. L. Ray	A. N. Archie
F. D. Longhurst	J. S. Winis
John Barbour	

It is expected that the formation of this chapter will attract the membership of other service engineers located in Nashville and surrounding environs, and additional meetings have been provided for to complete the final arrangements for the chapter. To serve as Temporary President, Mr. Robert L. Ray was elected.

S S S

D. D. Davis,
California

The SERVICE ENGINEER is filled with good information, and I find it very helpful.

Mohawk Valley, Boston, Wyoming Valley and Scranton Receive Charters

BOSTON CHAPTER

ON August 11, charter members of Boston Chapter participated in a dinner meeting, held at the Parker House, the occasion being the receipt of the charter for the local chapter from the National Society. President John B. Coffey presided as Chairman, and several visitors were introduced, including Mr. Russell E. Davis, a charter member of St. Louis Chapter.

President Coffey introduced National Secretary H. T. McDermott, who expressed his pleasure at having the opportunity of discussing further, the objectives of the National Society, and at the conclusion of his talk, presented the charter, which was accepted by President Coffey on behalf of Boston Chapter, who expressed in a few well-chosen words, the desire of Boston Chapter to participate in and contribute to the further advancement of the National Society. A brief discussion regarding the future plans of the local chapter took place after the business of the evening.

MOHAWK VALLEY CHAPTER

ON August 9, a very interesting meeting was held at the home of Mr. Clarence M. Doyle, secretary of Mohawk Valley Chapter, at which National Secretary H. T. McDermott was in attendance to present the charter to the chapter. Mr. William Bodmer, 1st vice-president, presided and accepted the charter on behalf of Mohawk Valley Chapter. Many proposals regarding the activities of the chapter were considered and discussed, and plans made for its future activities.

Mr. C. P. Vaeth provided the refreshments for the evening.

WYOMING VALLEY AND SCRANTON HOLD JOINT CHARTER MEETING

AN eventful evening in the young but active history of Scranton Chapter was recorded on August 16. Mr. Theodore I. Glou was Chairman of the Committee on Arrangements, and this meeting was unique in that it provided for the presentation of charters to two chapters meeting jointly. The meeting was held in Scranton, at the Chamber of Commerce Bldg., and was preceded by a dinner. Practically a 100 percent attendance of the Scranton members were present.

Mr. Peter T. Ferrese acted as toastmaster, and presented the presidents of both chapters—Mr. Frank Schultz, president of Wyoming Valley Chapter, Wilkes-Barre, Pa., and Mr. William Franklin, president of Scranton Chapter, who were called upon to address the meeting. The toastmaster then introduced National Secretary H. T. McDermott, who outlined the operation of the National Society, and explained its purpose in contributing to the educational advancement of its members, and pointed out the advantages of a local chapter in elevating the standards of the service engineering profession. He then proceeded with the presentation of the charters to both chapters, which were accepted by Presidents Franklin and Schultz. Interesting questions were a part of the meeting, and a general discussion was participated in by the members of both chapters.

Newspaper publicity preceding and following the meeting has created considerable interest in the Society, and has been instrumental in attracting the attention of the users of refrigeration equipment.

S S S

A. A. Longstreet
Missouri

I have been a subscriber to the R.S.E. since I graduated from Coyne School in November, 1937, and I sure get my money's worth just from the Question Box.

S S S

NEW CHAPTER IN PEORIA, ILL. BEING FORMED

ON Sunday, August 27, a group of service men met in the store of R. E. Thompson Co. in Peoria to lay plans for a new R.S.E.S. chapter.

The meeting was opened by Mr. Leonard Nelson of Galesburg, who is president of the Mississippi Valley Chapter and temporary chairman of the Illinois Association of R.S.E.S. Mr. Nelson outlined briefly the objects of the Society and then called on Mr. E. H. White, of Elgin to continue the ex-

planation. Mr. White explained the educational and social opportunities that may be obtained through chapter affiliation.

Mr. Nelson then called on Mr. Willis Stafford, of Aurora, who explained the future program of the National Society and the details of actually organizing a chapter. After this a petition for charter was signed by most of the Peoria service men present.

A temporary chairman, Mr. Fred Volkman, of Peoria was chosen. Mr. Volkman is at present a member of the Springfield chapter. A meeting was set for Friday, September 2, at which time it is hoped a sufficient number of service men will be present to form a chapter.

S S S

F. E. HANSEN, SYDNEY, AUSTRALIA, ON U. S. VISIT

MR. F. E. HANSEN, general manager of F. C. Lovelock, Pty. Ltd., Sydney, Australia, is spending considerable time in the United States visiting various sources of supplies for refrigeration work. It is interesting to learn from Mr. Hansen of the advancement that refrigeration is making in Australia, and the important market that this country offers. Right now, Mr. Hansen says, Australia will be entering the spring season, and when we experience our snowfalls, summer temperatures will be enjoyed over there.

Mr. Hansen personally delivered a message of greeting from The Australian Institute of Refrigeration, of which he is a member, to the Refrigeration Service Engineers Society.

The Australian Institute of Refrigeration
Melbourne, Australia, July 8, 1938.

Secretary
Refrigeration Service Engineers Society
433-435 North Waller Avenue
Chicago, U. S. A.

Dear Sir:

On behalf of the officers and members of our Institute, we are directed to convey their sincere greetings to your Society through the bearer of the present letter, Mr. Frank E. Hansen, of Sydney, N. S. Wales.

Mr. Hansen is one of our esteemed members, and our official representative in that State, and we ask you to accept our thanks in advance for the anticipated courtesy of your kind reception of our friend.

Yours faithfully,
(Signed) W. E. Dobney, President.
G. W. Boulton, Hon. Secretary.

WISCONSIN STATE ASSOCIATION PICNIC

THE Madison Chapter was host to over a hundred members, their families, and friends from Wisconsin and Northern Illinois at Tenney Park in Madison, Sunday, July 31. A large dinner was enjoyed by those who attended and in addition throughout the day ice cream and soft drinks were served. The occasion was the annual Wisconsin State Picnic.

Mr. Clarence Buschkopf, Beaver Dam, national director, devoted considerable time to planning and directing the affair. The committee consisted of R. P. Sweeney of Gustave A. Larson Co., as general chairman and he was assisted by Gustave A. Larson, Mead Robertson, Edward King, Phil Noth, H. A. Struthers, Morris Bakken, R. F. Leibly, Mrs. Gustave A. Larson, and Mrs. H. A. Struthers.

Attendance was registered from Janesville, Jefferson, Beaver Dam, Milwaukee, Watertown, Albion, Columbus, Marshall, Portage, Sheboygan, Wis., and Chicago and Pecatonica, Ill. Also a large delegation from the Rockford, Ill., Chapter attended, which helped a great deal to make the picnic successful, not only in numbers but with a snappy ball team which defeated the Madison team by a score of 41 to 12.

Thirty attendance prizes were awarded to the members and their friends, and races were held for the children.

Several manufacturers' representatives were present among whom were: Mr. E. C. Eichkoff of Chase Brass and Copper Co., Mr. C. McGee, and Mr. Daniel J. Gott of Detroit Lubricator Co.

The following manufacturers were responsible for a great deal of the success of the picnic:

Automatic Products Co.
C. F. Burgess Laboratories, Inc.
Bussman Mfg. Co.
Chase Brass & Copper Co.
Chicago-Wilcox Mfg. Co.
Minneapolis-Honeywell Regulator Co.
Dayton Rubber Mfg. Co.
Detroit Lubricator Co.
Duro Metal Mfg. Co.
Fedders Mfg. Co.
Henry Valve Co.
Imperial Brass Mfg. Co.
Peerless of America, Inc.
Rotary Seal Co.
Gustave A. Larson Co.
Filmite Oil Co.
Ranco, Inc.

VIEWS OF THE STATE PICNIC AT MADISON, WIS. 1—Madison Chapter Secretary, Phil Noth, dishes "em up." 2—Callahan at bat—Geo. L. Poster catching. 3—Talking shop after the fray. 4—G. A. Larson in the role of peanut vendor serving the ladies. 5—"Slugger" Roy Shipman, of Rockford, at bat—H. A. Struthers, of Madison, catching. 6—Everybody enjoys the noon-day meal. 7—Rockford scores another run. Final score: Rockford 41—Madison 12.

KEROTEST

YOUR GUIDE AND GUARANTEE TO DEPENDABLE REFRIGERATION FITTINGS

Build goodwill and lasting satisfaction with your customers by installing genuine Kerotest Refrigeration Fittings, nationally distributed through leading jobbers carrying complete stocks for your every service requirement. Your local Kerotest Jobber, listed to the right, will be glad to serve you.

KEROTEST MANUFACTURING CO., PITTSBURGH PA.

Jarrow Products Co.
Kerotest Mfg. Co.
Wagner Electric Co.

This support was greatly appreciated by the committee and members of the local chapter.

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

CENTRAL NEW YORK CHAPTER

July 31—The chapter on this date held a clambake at Bear Trap Park, with a very good turnout, and an enjoyable time was had by all. On August 8, a meeting was held at Onondaga Auto Supply Co, 353 E. Onondaga St. Mr. McDermott, national secretary, was the guest of the meeting, and gave a very interesting talk on happenings within the Society, as well as a very concise report of the progress of the 5th Annual Convention, to be held in Buffalo, November 2, 3 and 4. Mr. Lon S. Cooper, Frigidaire representative, was then introduced, and spoke at length on the cooperation being tendered independent service organizations. He also explained the equipment his factory is offering for exact replacements on Frigidaire installations.

TRI-COUNTY CHAPTER

July 17—The meeting was opened with some discussion on the forthcoming picnic to be held at Brauer's Grove, east of Aurora, on July 24. The meeting was then turned over to Mr. Joe Dean, of the Detroit Lubricator Co., who introduced Mr. Van Tyle, of the Midwest Engineering Co., who proceeded with an interesting demonstration of the refrigerant leak alarm. Following Mr. Van Tyle was Mr. Bud McKee, of the Detroit Lubricator Co., who gave an interesting and educational talk on thermostatic expansion valves. The thanks of the Chapter were extended to these gentlemen for their cooperation in producing this educational program.

DAYTON CHAPTER

August 5—After the usual business session of the evening, the meeting was turned over to the Educational Chairman, who introduced Mr. Baker, of the Minneapolis-Honey-

FOR QUICK SERVICE

KEROTEST

REGISTERED U. S. PAT. OFF.

REFRIGERATION PRODUCTS

Phone your nearest distributor

JOBBERS WITH LOCAL STOCKS

Albany, N. Y. ..... Hoy & Co.
Allentown, Pa. ..General Refrigeration Supply Co.
Atlanta, Ga. .J. M. Tull Metal & Supply Co., Inc.
Atlanta, Ga. ..Bowen Refrigeration Supplies, Inc.
Baltimore, Md. ..... Clendenin Bros., Inc.
Baltimore, Md. .Melchior, Armstrong, Dessau Co.
Binghamton, N. Y. ....Syracuse Equipment Corp.
Boston, Mass. ..... A. E. Borden Co.
Bridgeport, Conn. ..... Parsons Bros.
Brooklyn, N. Y. .....
..... Coleman Electrical Supply Co., Inc.
Brooklyn, N. Y. .Melchior, Armstrong, Dessau Co.
Brooklyn, N. Y. ..... The Capson Co.
Buffalo, N. Y. ..... Root, Neal & Co.
Cambridge, Mass. .....
..... Melchior, Armstrong, Dessau Co.
Charleston, W. Va. .....
Air Conditioning & Refrigeration Supplies, Inc.
Charlotte, N. C. ..... Henry V. Dick Co.
Chattanooga, Tenn. ..... Noland Co., Inc.
Chicago, Ill. ..... H. W. Blythe Co.
Chicago, Ill. .....Borg-Warner Service Parts Co.
Chicago, Ill. ..... Fred C. Kramer Co.
Chicago, Ill. ..... H. Channon Co.
Chicago, Ill. .....
.....Automatic Heating & Cooling Supply Co.
Chicago, Ill. .....The Harry Alter Co., Inc.
Chicago, Ill. ..... Airo Supply Co.
Cincinnati, Ohio..... The Merkel Bros. Co.
Cincinnati, Ohio..... Williams & Co., Inc.
Cleveland, Ohio.....The Harry Alter Co., Inc.
Cleveland, Ohio..... Williams & Co., Inc.
Dallas, Texas ..... The Electromotive Co.
Davenport, Iowa ..... Republic Electric Co.
Dayton, Ohio..... The W. H. Kiefaber Co.
Denver, Colo. ..... Auto Equipment Co.
Detroit, Mich. ..... J. M. Oberc, Inc.
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well Regulator Co. Mr. Baker demonstrated, with the help of moving pictures, the operation and construction of controls manufactured by his company. The movies showed the parts in operation and a complete system, as installed in a commercial installation. Refreshments were served after the meeting, and a general informal get-together was enjoyed by all.

WICHITA CHAPTER

August 5—Due to President Ryan's illness and inability to be present, Vice President Govits presided over the meeting.

As a token of sympathy from the Chapter flowers were ordered sent to President Ryan.

After the usual business was disposed of, a general round table discussion of service problems occupied the remainder of the evening and was enjoyed by all.

SPRINGFIELD CHAPTER

July 13—The meeting was opened by President McVay, and the first order of business was a vote taken as to the acceptance of applications received, with the result that the following were voted to membership:

A. L. Fait	William Benner
John Pokora	A. L. Hammond
J. J. Kline	Edward Greig
John Stoppelwerth	R. M. Potter
D. K. Burbank	Edward Bopp
Roy Westenberger	V. E. Conder
C. A. Hosten	Lyman Peck
R. S. Dobbins	E. D. Kresse
David Greig	F. W. Nichols
Syl Grossberg	C. F. Lindieman
Charles J. Fox	Kenneth Brotty
R. J. Pennington	J. C. Holdrith
Fred C. Volkman	A. J. Pasquole

After some discussion, it was decided the territorial jurisdiction of the Chapter should be extended to within a 75-mile radius of Springfield. A vote was then taken to fill the vacant offices of the Chapter, with the result that the following were elected: Mr. Sylvester Grossberg, *1st Vice-President;* Mr. E. D. Kresse, *Treasurer;* Mr. A. L. Hammond, *Secretary.*

July 27—Most of the business of this meeting was centered around the discussion of

the forthcoming picnic, which was suggested by Mr. Brown, of Brass & Copper Sales Co., St. Louis, Mo., the guest of the evening. Mr. McVay appointed A. L. Hammond, A. L. Fait, Roy Westenberg, J. J. Kline and R. S. Dobbins to act with the Ladies' Committee on the picnic arrangements. The location was decided upon as the picnic grounds at Lake Springfield, and is to be held August 7. Donations to the amount of $25.00 were received from three of the Springfield jobbers.

August 25—After a lengthy discussion of the proposed changes in the Constitutions and By-Laws of the State Association, it was decided by members present that the Springfield Chapter being formed after the Constitution and By-Laws for the State Association was written that we should not sponsor such a change.

A discussion followed concerning the Convention in which Mr. Hickox, Manager of the Leland Hotel suggested that we contact the Chamber of Commerce and find out how much assistance they can give on the Convention. A report of same to be mailed to the Convention Committee.

PITTSBURGH CHAPTER

July 29—A special meeting of the Pittsburgh Chapter was held at the Minneapolis-Honeywell Company, 86 S. 26th St. Mr. E. V. Black presided. About seventy members and friends were in attendance. All business was postponed to give enough time for the presentation of the movie and lecture on the Polartron Control.

Mr. Black introduced Mr. J. R. Green, manager of the Pittsburgh Branch, who welcomed the men and outlined the program for the evening. He also introduced Mr. Sweeney and Mr. Tracey, who presented the movies and explained the operation of the control. After a period devoted to questions, the members had an opportunity to observe the operation of the control on an installation in the room.

Refreshments were provided and the assembly enjoyed a few hours of social activities and discussion.

REMEMBER BUFFALO NOVEMBER 2-3-4

ILLINOIS STATE CONVENTION TO BE HELD OCTOBER 1-2

AT a meeting of the Illinois State Association of the R. S. E. S., held in Springfield, Illinois, July 17, it was decided that a State Convention would be held October 1 and 2 at the Leland Hotel, Springfield, Illinois.

Mr. McVay, president of Springfield Chapter, opened the meeting with a few brief remarks, and then turned it over to Mr. McDermott, National Secretary, who in turn introduced Mr. Nelson. Committees were immediately appointed, and arrangements begun for this first Illinois State Convention.

The program, which was outlined in the meeting and which will be enlarged upon at a later date, specifies:

Registration—10 a.m., Saturday morning, October 1

Educational Meeting—1 p.m. to 4 p.m., Saturday afternoon

Dinner and Dance—7:30 p.m., Saturday night

Educational Meeting—10 a.m. to 1 p.m., Sunday, October 2

The following committee chairmen were appointed, and instructions were given them and the chapter presidents to appoint the balance of the committees, and submit the appointments to the State Secretary by August 1:

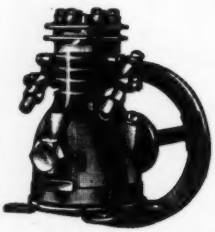
Membership Committee—Mr. S. Grossberg, *Chairman*

Exhibit Committee—Mr. E. H. White, *Chairman*

Educational Committee—Mr. A. L. Fait, *Chairman*

Hotel and Program Committee—Mr. P. W. McVay, *Chairman*

Mr. Hickox, manager of the Leland Hotel, who was present at the meeting, discussed the facilities offered by the hotel, and pledged his cooperation in sending out publicity and postcards for advance registrations. It is expected a large turnout will be enjoyed, and the committees in charge ask that all Illinois members cooperate to the extent of attending and making this a worthwhile meeting.



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Mechanical improvements include, force feed lubrication to piston pin and connecting rod bearings, positive alignment of cylinder bores with main bearings by casting cylinders and crankcase in one piece. Adjustable suction shut-off valve, interchangeable parts with single and twin cylinder models. All compressor parts are machined to precision limits on up to date equipment and assembled in glass enclosed rooms where only filtered, dust free air is admitted.

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ERNEST P. HAUK OF CENTRAL NEW YORK CHAPTER, DROWNED

MEMBERS of the Central New York Chapter in Syracuse, New York, are regretting the loss of one of their charter members, Ernest Paul Hauk, age 27, of 146 Lincoln Ave., Syracuse, who drowned in the Seneca River at Jack's Reef, August 7.

He drowned before the eyes of two fishing companions when he stepped off a shoal in Seneca River into deep water after just escaping a similar fate when their fishing boat overturned.

Rescued from the Seneca River at the time Hauk lost his life were his two fishing companions.

The three men were out on the river in a hired outboard motor boat when the light craft overturned as one of the trio stood up, according to witnesses.

Mr. Heckart of Syracuse went to their rescue with a rowboat and found the three men clinging to the sides of the overturned boat. Hauk and one companion transferred their holds to the rowboat and Heckart was towing them to shore when Hauk's feet trailed over the shoal and he found he could stand. He released his hold and started to wade away from the boat towards the shore.

Heckart's wife was standing on the dock, at the boat livery, with others watching the rescue when she saw Hauk wade. She and others yelled to him that where he was wading was deep, but he did not hear them and kept wading until he was beyond his depth. He floundered about for a second and then sank.

Heckart dived out of his rowboat for Hauk but was unable to bring him to surface. He dived a second time and found that Hauk was gripping weeds at the bottom of the river. Help was then summoned and the rescue squad helped break Hauk's grip and brought him to the surface.

Artificial respiration was given but proved futile, and he was pronounced dead.

He was a native of the city of Rome, a graduate of Rome High School, employed by Cooney Refrigeration Co. and had studied at the Carrier Corporation School. He was a brother-in-law of Francis G. Mackin, 615 Caleb Ave., also a member of the R. S. E. S.

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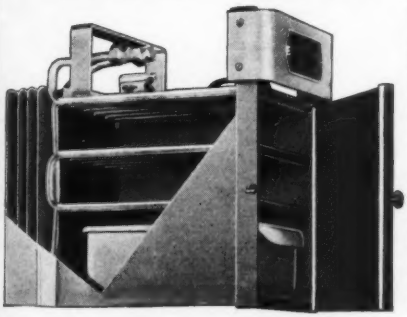

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The "cartridge-fin" type of concealed secondary surface generates and maintains constant circulation of the cooled air within the refrigerator—and performs this important service as no other evaporator will. There is no chance of a "well" of cold air forming when "Humidi-Pack" is on the job.

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A RED LETTER DAY

MARIE PETERSEN, Secretary to E. L. Bengston of Mississippi Valley Chapter, had the sensation of her young life Saturday, August 13, when she got her first haircut. Well, the first for a number of years.

ONTARIO MAPLE LEAF CHAPTER ENJOYS ITS FIRST ANNUAL PICNIC

THE First Annual Picnic of Ontario Maple Leaf Chapter was held Sunday, June 26th at Huttonville Park, located about thirty-five miles from Toronto.

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SPECIALIZED TOOLS FOR REFRIGERATION SERVICE

The R-200B set (illustrated) is composed of units designed especially for installation and servicing of refrigeration equipment. It contains a reversible type ratchet with ¼" square opening for work on valve stems . . . 1½" extension . . . 2 adaptor plugs . . . 1 Kerotest valve packing nut socket . . . 5 square valve stem sockets . . . 5 packing gland nut sockets, and 7/16"-½"-9/16" double-broached Hexagon sockets. Available only through our own branch distributing warehouses located in 37 principal cities. See Snap-on Tools in your city phone directory or send coupon below.

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R-200-B Refrigeration Set Designed especially for refrigeration work. Complete in metal box.

Through the efforts of the Entertainment Committee headed by Mr. Kenneth Wood, a very enjoyable day was spent by the members, their wives and families and friends to the number of about two hundred persons.

The kind cooperation of a number of concerns connected with the refrigeration industry, who made donations in the form of cash or supplies, assured a plentiful supply of ice cream, milk and soft drinks as well as providing the committee with means to provide prizes for racing events.

After lunch, a program of races for the young and those not so young was disposed of and prizes distributed.

A game of soft ball was organized between two teams termed the Automatics and Thermostatics and it is believed that the Thermostatics won by an overwhelming score. Ken Wood accepted the nomination of umpire and seemed to survive the ordeal although several of his decisions did not meet with general approval.

Horse shoe pitching was also indulged in by some who desired this less strenuous form of entertainment.

The refreshment stand was in charge of Sgt. at Arms Jas. Spence ably assisted by Geo. Aitken and others.

Treasurer Frayne insisted on taking the Secretary for a buggy ride, much to the consternation of Mrs. Doan from whom the carriage had been stolen.

At the conclusion of supper the picnic was disbanded with everyone looking forward to a similar affair next year.

LOS ANGELES CHAPTER PRESENTS A NEW GLASS EVAPORATOR

AT a regular meeting of the Long Beach Chapter of the Refrigeration Service Engineers' Society, Mr. W. D. McKnight presented as his speaker, L. P. Roth of Refrigeration Service, Inc., Los Angeles parts jobbers, who had as his subject "The Action of Refrigerants in Evaporators," which was demonstrated by a glass evaporator built by his company.

The speaker devoted a few minutes at the beginning of the talk to a brief description of refrigeration unit vibration absorbers, refrigerant dryers and the Vacuumator, a device for evacuating and drying refrigeration installations in the field. The balance

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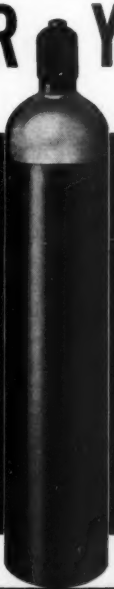

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of the talk then concerned itself with demonstrations of the glass evaporator.

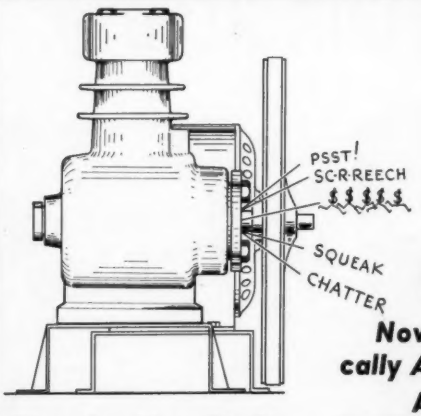
The apparatus consisted of approximately 28 feet of 5/8 inch glass tubing in the form of a flat grid, measuring 18 x 18½ inches. Copper tubing was cemented to both ends of the grid, which was then set in a circular frame mounted so that it would revolve in the upper portion of a hollow vertical panel three feet wide by six feet high by six inches deep. The revolving portion contained in addition to the evaporator a hand expansion valve, a No. 676 Detroit automatic expansion valve and a No. 679 Detroit thermal expansion valve. The liquid lines were so manifolded on the revolving frame that by means of Kerotest packless valves, the hand expansion valve, the automatic valve or the thermal valve could be made to refrigerate the coil. The bulb from the thermal expansion valve power element was placed inside the end of the evaporator at a point where it could be seen in the glass tube. This method of installing the bulb was used in order that the action of the thermal valve could be more easily seen.

The framework holding the evaporator could be rotated through an arc of 180 degrees, thus causing the evaporator to have either a top feed, a vertical feed or a bottom feed.

The inside of the vertical panel contained liquid and suction lines from the unit, flexible lines to connect to the revolving framework, fans to maintain temperatures above 32 degrees in the coil, and a diffused light source mounted behind the evaporator itself. The entire panel with the evaporator was attached to an angle iron framework, upon which, at the back of the panel was mounted a ¼ horsepower refrigerating unit, using a Majestic single blade rotary compressor, connected to suction and liquid lines through vibration absorbers and a suitable dryer.

The speaker first demonstrated the action of an automatic expansion valve in both top and bottom feed positions, showing that so-called dry expansion was not really dry, and that not a great deal of difference existed between the action of the expansion valve on a top or bottom feed coil. In this demonstration the action of refrigerant would be seen at constant back pressure, gradually working through the coil as heat was removed from the evaporator tubing.

The thermal expansion valve was next con-



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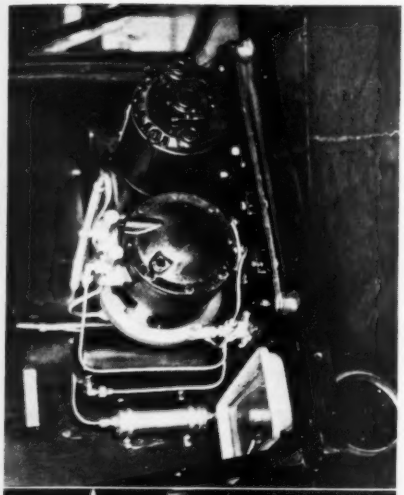
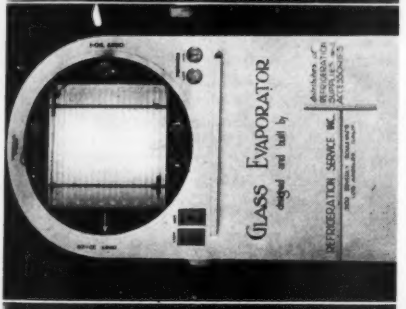
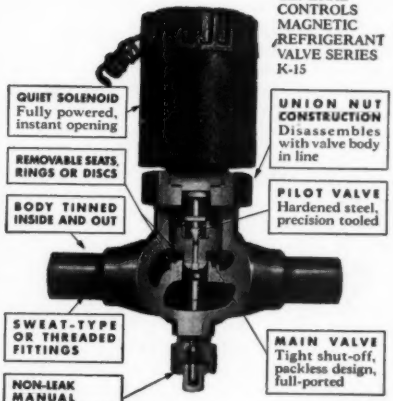




INSIDE FACTS



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nected to the evaporator, which was refrigerated in top feed, vertical feed and bottom feed positions. By this demonstration those present were able to understand visually the primary difference between the action of a thermal and an automatic expansion valve in refrigerating a lowside. One of the interesting things noted was that with both automatic and thermal valves, when the evaporator was in the bottom feed position, the tubes were not actually full of liquid, as is frequently assumed. The velocity of the vaporized refrigerant from the time it left the expansion valve needle was sufficient to carry liquid upward through the coil, at the same time keeping all of the tubes well below half full of refrigerant.

The speaker explained that one of the reasons for selecting the Majestic compressor for the installation was the fact that in the highside dome surrounding the compressor, practically all of the oil was separated from the Freon, which was used as a refrigerant, thus admitting only pure refrigerant to the evaporator. This he demonstrated by closing all of the valves and evaporating the refrigerant from the lowside, leaving practically no oil residue. In order to demonstrate an oil-logged condition in the evaporator, therefore, he made use of an oil by-pass connected between the base of the compressor and the liquid line beyond the receiver outlet. Upon opening a valve in this line for a few seconds sufficient oil was by-passed to cause a predominantly strong oil mixture in the refrigerant. Considerable frothing could be noticed in the oil-refrigerant mixture, as well as a sluggish action from the thermal expansion valve bulb.

Highside and lowside gauges installed on the face of the demonstration panel recorded the difference in operating characteristics when the evaporator was oil-logged.

As a final demonstration the evaporator was refrigerated with the automatic valve and a thermostat was hung on the front of the demonstration panel with its bulb attached to the end of the glass evaporator. The thermostat was then cut into the motor leads, and by stopping the fans so that the evaporator temperature could be lowered fairly rapidly, the action of a lowside with an automatic valve, controlled by a thermostat, was actually seen.

The talk was followed by a general discussion, including the answering of a number of questions. At the conclusion of this discussion, a short business meeting was held.

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Refrigeration Service

By **W. HALL MOSS,** *President,* **R.S.E.S.**

IT is indeed a pleasure and privilege to be able to give expression to some of my ideas on the subject that is foremost in our minds—Refrigeration Service.

It is very unfortunate for the refrigeration industry and for the users of such equipment that the servicemen are assumed to be mechanics. Those of us who realize that refrigeration servicing is a profession are doing everything within our power to elevate it to that plane. It is only a matter of time until the work of maintenance will be in the hands of men who are capable and whose income will be based on what they know, not on the time they spend on a specific job, or what they claim to do.

There are too many unqualified men in the refrigeration service field today; too many men who do not realize the extent or importance of the work in which they are engaged; too many who are not adapted to do refrigeration service; too many who do not have the fundamental training that is necessary to be successful; too many who do not appreciate that the requirements imposed upon a refrigeration serviceman today are far more rigid than those of a few years ago.

"Profession," "trade," "mechanic" are three words that are often very badly confused, particularly by refrigeration servicemen and the others connected with the refrigeration industry. A great many people refer to refrigeration servicing as a "trade" and the servicemen are classed as "mechanics." Hence, they have come to be considered in the same category as mechanics in the various other trades.

To better understand this matter, let us consider the definitions of these terms:

Profession—A vocation, especially one that requires an education on the fundamental technical part of that vocation.

Trade—An occupation; dealing by way of buying and selling and with no regard to an education.

Mechanic—A skilled workman without any reference to an education.

Thus, we readily see, that there is, therefore, a vast difference between a professional man and a mechanic. A mechanic may not be conversant with the principles involved in his work, nor the many devices upon which he works. The main point is that he knows

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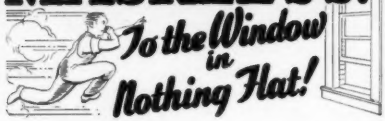

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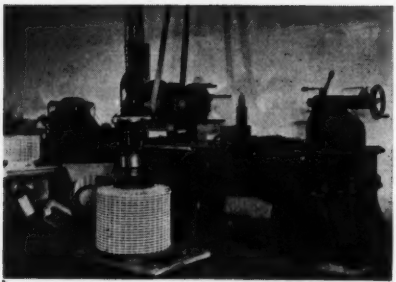

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Flushing Refrigeration Co., Inc.

HERMETIC ENGINEERS

133-22 41st AVE., FLUSHING, N. Y.

what tools to use at the proper time and how to handle them in order to do the work that is laid out for him to do. The professional man, on the other hand, combines his ability as a mechanic with the fundamental training in his vocation. He exerts every effort to keep himself fully informed concerning the developments of the art with which he has allied himself. He can lay out the work to be done and do it.

The mechanic type of serviceman may claim that he is keeping abreast of the times, but unless he has grounded himself in the fundamentals he is not in a position to fully understand the meaning of the new devices nor to analyze them. His lack of ability in this respect results in his getting deeper and deeper into the realms of the unknown and his ability as a serviceman becomes less with each successive development that is introduced.

The professional type of serviceman, on the other hand, versed in the fundamental principles of refrigeration, recognizes the necessity for keeping in close touch with what is going on in the industry. His contact is not restricted to engineering developments, but he follows the news also, although, undoubtedly, the technical side is of more importance to him. He knows that he is adapted to the work which he has chosen as is evidenced by his contentment. He has applied himself to the task of securing a full and complete training in the fundamentals. He has a complete assortment of testing equipment that will enable him to perform his work with ease and dispatch. He goes about his duties in a business-like manner that cannot fail to impress his clients. He is courteous and he does not make slighting remarks about other servicemen, or the products that he is working upon. He knows that when he knocks the work of another that he lowers himself and his profession in the estimation of his customers.

Taking the mechanic class of servicemen in contrast, in most cases, this type of service-

PICTURED ON PAGE 52

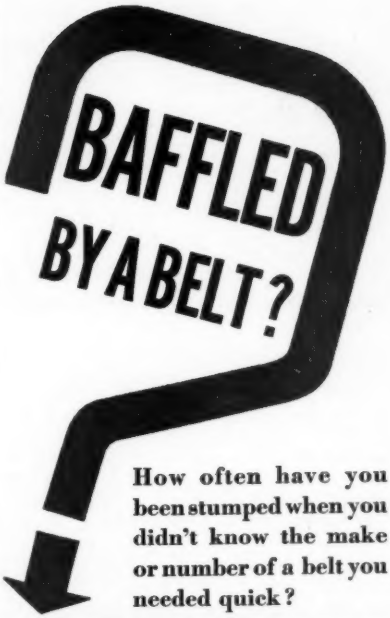
SPRINGFIELD CHAPTER PICNIC

The First Annual Picnic of the Springfield Chapter of the Refrigeration Service Engineers Society, was held Sunday, August 7th, at the picnic grounds at Lake Springfield.

The picnic was featured by a basket dinner, after which all types of games were played. Horseshoes and baseball were particularly enjoyed by the men, and the women were entertained by a lady from the Springfield Playground and Recreation center.

Mr. Grossberg and Mr. McVay chose up sides for the baseball game which was won by Mr. Grossberg's aggregation by a score of 26 to 13.

The day was closed by a moonlight cruise on Lake Springfield.



How often have you been stumped when you didn't know the make or number of a belt you needed quick?

FIND THE RIGHT FIT FASTER!

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Gilmer Belts *fit* 4450 models of refrigerators, 247 makes of air-conditioners, etc.

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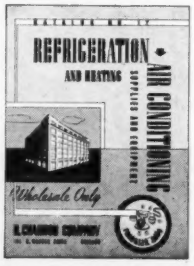
Trouble in the cooler! Dead air spots and freezing zones are impairing foods . . . Humidity, too high or too low, is causing still more grief . . . That's the time for the Service Expert to recommend — demonstrate — install Action-Air System. Action-Air is a patented system of correct air circulation for coolers. A demonstration sells it. Pays its own way through savings. Makes good profits for you and leads to repeat business. Proved in many uses since 1932. Write for attractive proposition. THE BROWN CORP., 614 Bellevue Ave., Syracuse, N. Y.

ACTION-AIR SYSTEM

man is egotistical and holds the opinion that his knowledge of refrigeration is ample. He reasons with himself that as he has handled all his service calls of last week, or last month, or last year, that he will not have any trouble in the future. His charges for services are usually based upon the amount of time spent on a job at so much per hour, with no consideration for overhead. He applies the "rule of thumb" method in diagnosing troubles and repairing them. His lack of fundamental training makes it impossible for him to grasp new ideas quickly. He "alibis" his failure in specific instances by shifting the blame for inefficient service upon the equipment. He belittles other servicemen and products that do not strike his fancy. He condemns merchandise because of prejudice and then reverses his opinion if one who handles that product flatters him. His tools and test equipment is sadly deficient and he usually expresses the opinion that there is no need for high-grade tools and test equipment. If one would stop to consider this last point, it is evident that his reasoning is based upon the fact that he would not be capable of handling modern equipment.

The professional man is distinctive in another respect. We will cooperate with fellow servicemen. He recognizes the necessity for organization in order that cooperation will be simplified. He appreciates the value of associations and the association with other men engaged in the same field of endeavor in order that ideas might be exchanged. He keeps himself informed on refrigeration developments by study and by careful reading of the proper books and his industry magazine. He sees the folly of each individual attempting to carry on alone. He considers that although he may be putting forth his best efforts there are certain things that he will overlook and which will be brought to his attention by those with whom he has a reading acquaintance. For this reason we have started this Society—the Refrigeration Service Engineers' Society.

The mechanic type is a direct opposite to the professional type. He refuses to associate with other servicemen on the ground that he will divulge valuable information. He holds the opinion that his knowledge of refrigeration is superior to that of others and that no one can tell him anything about which he has already learned. He has



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Engineers make it a point to "ask Rempe" whenever there is a particularly tough problem of cooling, and when they want to be SURE of results. Coils or units for any refrigerant, for any size or type of installation. Write today for our new FREE useful data sheets.

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no use for study courses, books and magazines dealing with the all important field of refrigeration through which he expects to earn his living. Such a man is doing nothing but "kid" himself and will be eliminated in the end. If he were truthful he would admit that his refusal to cooperate with the others in the field and to learn something from them is due to his lack of knowledge of the work in which he is engaged and that he would be constantly in fear lest someone "put him on the spot" by asking a question he could not answer.

Refrigeration servicing is making unprecedented strides today. The quality of the personnel is improving and there are many men with University and College degrees who have taken up the work because they are interested in it and because they recognize its potentialities.

Your attention is directed toward the work that is being done to put refrigeration servicing on a professional plane by the Refrigeration Service Engineers' Society, a non-profit educational association that was formed some five years ago, with headquarters in Chicago. The founders of this Society reasoned that refrigeration servicing was above the plane of common labor; that the only solution to the problem was to rid the field of untrained and unsuited men and to fill their places with men who are educated, efficient, courteous, fair, reliable, and willing to cooperate with fellow members of the profession in order that all might reap the reward of advancement. Its activities are not confined to local areas, but extend to all parts of North America and will extend to the whole world. It is strictly a non-commercial Society whose members pledge themselves to aid in raising their activities to the status of a profession and maintaining it as such.

Refrigeration service is really an industry within itself, and a highly important one at that. The conduct of those engaged in it will determine the success of the entire refrigeration industry. The refrigeration serviceman is virtually the representative of the manufacturer and the merchandiser, when he enters the home of a customer to service the refrigeration equipment, and it is imperative that he be of the highest type. In order to attain that type of personnel the mechanics must be eliminated and professional men, cooperating with all other members of their profession, take the place of the mechanics.

Take All Wheel Gear Puller

A midget with the pull of an elephant. Every serviceman and shop needs one. High grade steel. Sturdy, compact, light weight (2 lbs.). Meets practically all requirements, where a puller is used. Changeable from three to two arm puller, almost instantly.

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QUICK SERVICE
PARTS · SUPPLIES · TOOLS
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DEPENDABLE ITEMS FOR ALL YOUR NEEDS
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CHICAGO
WRITE TODAY for NEW CATALOG

This is the time of year when servicemen or those who aspire to become servicemen, should give serious thought to the various possibilities that study has to offer. The day is past when all a man needs is the ability to put up a run of tubing or set a switch. He must know the common types of troubles encountered on service calls, and more important he must be able to analyze various troubles out of the ordinary. One with a mere smattering knowledge can eventually eliminate the cause for some troubles encountered, if given plenty of time. But a profitable service business is not built upon any such hit-and-miss basis as that. The patience to cut-and-try until the solution of a problem is found may be admirable in some things, but in refrigeration service it is out of place. A solid bedrock of knowledge is the only sure foundation upon which to build. Not only does such knowledge provide its direct benefit but it gives the serviceman confidence in himself and engenders the confidence of others.

It is true that it takes time and stick-to-it-iveness to acquire this knowledge, but it is worth the effort because it lifts the worker into the professional class where he is paid for his knowledge and what he accomplishes rather than on the basis of "so much per hour."

Acquiring such knowledge haphazardly through experience is possible—but it is tedious and expensive to all concerned. Taking advantage of the recognized assistance of the Refrigeration Service Engineers' Society's educational program offers a short cut which any man who wants to forge ahead in the field of refrigeration cannot afford to overlook.

Through knowledge gained by attentive study, cooperating with others of the refrigeration field the serviceman can place himself on the plane of the professional man only after he has used the foundation of the fundamentals of refrigeration, being fair to himself by being fair to all others.

Study, cooperation, square dealings, founded upon the fundamentals leads to success.

In CANADA
There is no more important accessory to commercial and ice cream installations than Oil Separators.
We have selected and been appointed exclusive distributors in Canada for
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at the following prices, F.O.B. Chicago

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Domestic Cold Controls (Modern Type)	2.00
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Commercial Dual Controls	3.00

ALL WORK GUARANTEED FOR 90 DAYS
NEW DUTY
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You NEED This!

This handy chart instantly shows the HEAD pressure—for ANY suction pressure at ANY room temperature for all air cooled installations using Sulphur Dioxide SO_2 Methyl Chloride or Freon F-12. Don't guess about head pressures —secure this chart immediately. Price $1.25. See Your Refrigeration Jobber, or send check to

R. W. Cook, Box 176, Columbus, Ohio

EXHIBIT AT THE LOS ANGELES AIR CONDITIONING SHOW

One of the attractive exhibits at the air conditioning show held in July, was that of the Franklin G. Slagel Co., manufacturer's representative of refrigeration, air conditioning and heating equipment. The exhibit included a showing among others of the Fedders line of refrigeration equipment and valves, Ranco controls and Gilmer belts.

HERMETIC REBUILDING SERVICE

G.E.—Westinghouse and Majestic

Customers in 37 states had hermetically sealed units rebuilt or exchanged by us in the past year. Complete factory equipment for precision rebuilding. One year guarantee on all rebuilt units. Exchange service available on most makes and models. Write for prices and descriptive literature.

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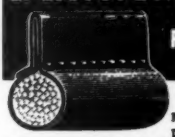
DENNIS GASKETS
FOR ALL MAKES
REFRIGERATOR
DOORS



A complete line of rubber - coated, packed Gaskets and extruded rubber Gaskets that last longer —retain higher efficiency—because made of finest materials and workmanship. Write for free samples, giving your jobber's name and address.

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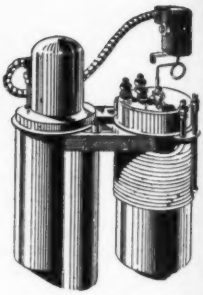
POSITIVE CONTROL LIQUID COOLERS

COLTROL D-X *(Left)* a dry-type instantaneous cooler, and COLTROL *(Right)* a brine-type cooler. Both types give you perfect temperature control and perfect foam control. Either fits standard beer coil box. All refrigerants. Permits steam or chemical cleaning of beer coils. A source of quick profits for you. See your Jobber or write direct.

COMMERCIAL COIL & REFRIGERATION CO.
459 North Artesian Avenue, Chicago, Illinois



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On all items for air conditioning and refrigeration. Parts, tools, and supplies. Our prices are always right.

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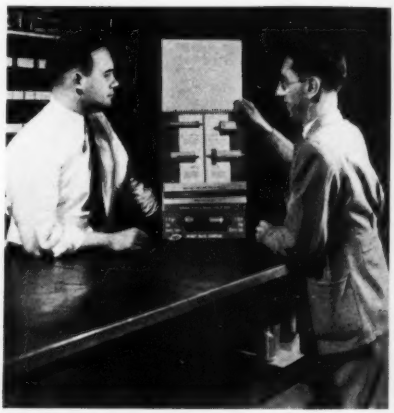
GILMER USING CATALOG STAND AS SALES AID

A COUNTER CATALOG STAND as a sales aid for counter service is being offered by the L. H. Gilmer Co., Tacony, Philadelphia, Pa., in connection with their merchandising of Gilmer Belts.

This stand is of standard steel construc-

GILMER'S NEW CATALOG STAND

tion with capacity for 8 inches of catalogs, which can be increased by coupling two or more stands together. The catalog holders can be removed instantly, allowing for quick changes of catalog sheets. It is available for either three or four hole punching.



"When a manufacturer makes an open book of the construction of his products, its news! Representing a new application of an old merchandising principle, the above display—developed for the Henry Valve Company by the Raymond C. Hudson Advertising Agency—enables jobber counter salesmen quickly and graphically to explain the construction and application of any item in the company's line at point of purchase. Inspecting the new nine page, four color display are Ray Hudson (right), and Bill Hauber, sales manager of the Automatic Heating & Cooling Supply Company, Chicago."

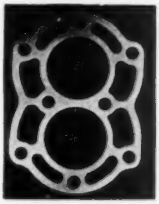
S S S

BOOK REVIEW

Air Conditioning by Charles A. Fuller, M.E. 576 (6 x 9) Pages, 300 Illustrations, including Charts, Diagrams, Floor Plans and Tables. Cloth Bound. Published by The Norman W. Henley Publishing Company. For sale by Nickerson and Collins Co., 433 N. Waller Ave., Chicago, Ill. Price $4.00.

AIR CONDITIONING is a distinctly unique study and reference book for all individuals. Incorporating the knowledge gained from over twenty-five years of engi-

REPLACEMENT GASKETS FOR ALL MAKES



Metallic Gaskets that hold regardless of what the refrigerant may be and will not shed particles of material to clog up important working parts in a machine.

Send for catalog listing many "orphans" not available elsewhere.

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NEW SERVICE KIT

Field Proven Hinsdale Tools of Quality in a compact roll. Whether you want the smallest or the most complete Service Set on the market you'll find just what you need in the extensive Hinsdale Line of Refrigeration Tools. Write for New Catalog.

HINSDALE MANUFACTURING CO.
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neering experience by the author, reviewed by other thorough and unbiased engineers, it at the same time, removes the cloak of mystery enshrouding the science of air conditioning and presents thorough explanations in simple, understandable language.

Included in its discussions are: the correct method of calculating heat gain in an enclosure; how to choose air volumes properly; how to supply air to an enclosure; how to design the most efficient duct systems; how to choose the necessary air handling and refrigerating equipment; how to select dehumidifiers, either of the cooling coil or air washer type; when a direct expansion type system should be used in preference to a circulating water type system and vice versa; how ice may be used in air conditioning; a discussion of steam jet refrigeration; a discussion of water vapor refrigeration; a discussion of the use of chemical dehumidification in air conditioning; an explanation of well water systems; and a general outline of prevailing codes and regulations.

Mechanical contractors, large or small, must fit themselves for this new industry, or face inevitable extinction. Architects must acquire a working knowledge; engineers must become proficient in the field; technical students must expand their studies; prospective buyers can well afford to post themselves. Here is a truly masterful work that will tell you all you need to know about air conditioning.

F. G. HOOD, PRESIDENT OF ANSUL CHEMICAL CO., DIES SUDDENLY

FRANCIS GEORGE HOOD, president and founder of the Ansul Chemical Company, Marinette, Wisconsin, died August 9, 1938. Stricken suddenly with a heart attack while attending his firm's annual picnic in Henes Park, Menominee, Michigan, Mr. Hood was taken immediately to the hospital where medical assistance proved of no avail. Apparently in good health, Mr. Hood had greatly enjoyed all the races, games and stunts on the afternoon picnic program. While assembling for the picnic supper, Mr. Hood suffered the heart attack that proved fatal within less than a half-hour. His passing is not only a terrible shock and loss to his family, friends and business associates, but also to every one of the employees of the Ansul Chemical Company who knew him very personally as their close friend and advisor, rather than the President of the Company giving them employment.

Born in Saginaw, Michigan, August 21, 1878, Mr. Hood would have celebrated his sixtieth birthday this month. He attended grade and high schools at Saginaw, Riverview Military Academy and Brown University.

Mr. Hood started his business career in the lumber industry in Upper Michigan where he organized the F. G. Hood Co. and built the town of Pentoga, Mich. In 1909, he moved to Marinette and became President and General Manager of the Lignum Chemical Co. In the early part of 1915, he

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Shop Practice Included

Nothing has been overlooked to make U. E. I. training thorough and practical in every respect. Following the spare time home study that gives the principles of refrigeration and their practical application to ALL TYPES of equipment, U. E. I. men get two weeks of actual servicing and installing experience on all types of household and commercial refrigerating equipment.
U. E. I. trained men are fully trained. Some are available NOW.

Utilities Engineering Institute
404 N. Wells Street — Chicago

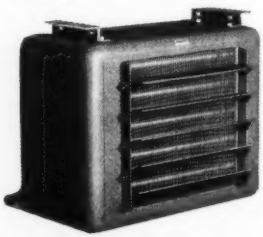
F. G. HOOD

organized the Ansul Chemical Co. From a small beginning, Mr. Hood developed a company that has played an important part in refrigeration history since the first domestic machines were produced. He has been very active in community and civic affairs, and held membership in many organizations, including the Commandery, Shrine and Consistory in Masonry, the Kiwanis Club and Alpha Delta Phi.

Mr. Hood was married 36 years ago to Katharine Chambers at Sherburne, N. Y. In addition to his wife, he is survived by two sons, Francis J. and Robert C. of Marinette and daughter, Jean, of State College, Pa.

NEW CATALOGS AND BULLETINS

REMPE COMPANY, 340 No. Sacramento Blvd., Chicago, has just issued a 40-page bulletin (No. 105) on the 336 cooling units which they make for low temperature and comfort cooling.

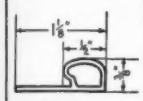


REMPE UNIT COOLERS

This very useful bulletin is filled with accurate engineering data and practical information on selecting the correct unit. It includes sample problems and solutions, tables covering air velocities, B.t.u. requirements for content cooling or product load, heat leakage and performance ratings.

The beautiful streamlined Rempe units, the result of exhaustive research and development, provide a selection of types and

Jarrow Replacement Door Gaskets



2523

The gasket illustrated was made especially for Kelvinator and Norge replacement. It fits. All JARROW gaskets are built to Manufacturers' original specifications. Insist on JARROW GASKETS.

JARROW PRODUCTS CORPORATION
420 N. LaSalle St., Chicago, Ill.

sizes suitable for all conditions of space cooling. The matter of making a selection from 336 different units has been thoroughly simplified and clarified and places selection on the basis of high efficiency—the basis sought for by all skilled air conditioning and refrigeration engineers.

Rempe has made a real contribution to the advancement of successful refrigerating work and this complete discussion of the subject should prove very helpful.

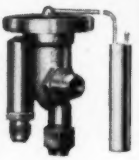
Minneapolis-Honeywell Regulator Co. has issued a bulletin, descriptive of the new Polartron System for refrigeration. In sixteen well illustrated pages, this bulletin describes the construction, purpose and operation of the system. Each part and function of the system is thoroughly explained, together with its installation, adjustments, and what advantage will accrue from its use. Wiring diagrams show how it may be connected in various types of refrigeration installations. Write the above company at Minneapolis, Minn., for your copy of this bulletin.

Superior Valve & Fittings Co. has just issued Bulletin R2 on Superior packless valves. The bulletin is very descriptive and includes illustrations, specifications and disassembling and assembling instructions for the removal of internal parts when soldering to the refrigerant lines. Included, also, are installation diagrams showing a complete installation of a meat market type.

Two separate diagrams are shown, one illustrating the use of the two-way diaphragm packless valve, and the other showing the use of the three-way valves, manifolded together.

Your copy of the Bulletin may be secured from the company offices at 500—37th St., Pittsburgh, Pa.

Proof of Trouble-Free Service—No ALCO "TK" Thermo Valve Has Ever Lost Its Charge!



SINCE its introduction not a single "TK" valve has been returned because of power assembly failure. Alco "TK" Thermo Valves offer you all the proven advantages of the famous Alco "T" series valves at a saving of 20 to 40% in cost.

Ideal for small refrigeration and air conditioning systems, Alco "TK" Thermo Valves deliver accurate, trouble-free service throughout their long life. Details include atomic hydrogen welded power assembly, large, adequate filter area, light weight and simple design, yet as sturdy as larger valves.

See your jobber for complete information and specifications.

ALCO VALVE COMPANY, INC.
2630 Big Bend Blvd.
St. Louis, Mo.

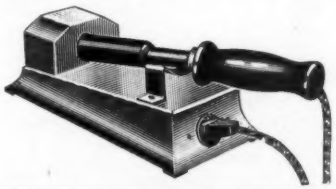
ALCO

Engineered Refrigerant Controls for Highest Evaporator Efficiency

NEW SOLDERING IRON STAND

A GREAT number of soldering operations call for extremely hot soldering irons in order to do fast and efficient soldering. Yet these same operations often times have a considerable period between soldering which permits the iron to come to an extremely high temperature, resulting in the burning off of the tinned surface.

The Thermostatic Control Stand cuts the iron in and out of the circuit at any selected temperature, depending on how hot the iron



should be for the work to be soldered. This very flexible device is highly efficient, saves much of the operator's time, prolongs life of the tip and of the soldering iron element, also effects real savings in current.

Index to Advertisements

★ ★ *It's Easy to Order* ★ ★

MILLER REPLACEMENT DOOR GASKETS

★ There's no guesswork about ordering Miller Replacement Door Gaskets. You make your selection from a handy catalog sheet which not only contains the prices and dimensional drawings for each of the 28 gasket types in the Miller line but lists the gaskets according to the make of refrigerator. Thus, knowing the requirements of your trade, it's an easy matter to choose those types for which you have most frequent calls.

Make door gasket replacements a feature of your refrigeration service. It's profitable business when you use the Miller line because their 28 gasket types enable you to service 80% of all refrigerators regardless of make. To obtain copy of catalog sheet listing the complete line, see your local jobber or write direct to

MILLER RUBBER COMPANY, Inc.

AKRON, OHIO

★ ★

IMMEDIATE DELIVERY

Miller

"Engineers in Rubber"

A New Book!

How to install, service, and repair all types of household refrigerators.

This book presents everything needed by the man who is servicing electric refrigerators, from a simple explanation of how they work to detailed, practical methods and data on installation, testing, servicing, adjusting, trouble-shooting, repairing, etc.

Household Electric Refrigeration

Including Gas Absorption System

By Wostrel and Praetz

406 pages, illustrated, $4.00

A practical manual for installation and refrigeration service men, giving descriptions and illustrations of many popular makes of machines, showing both the entire system and details of parts, and emphasizing the basic points of construction and operation. Besides the step-by-step descriptive material, numerous charts and tables giving reference information in handy form make this a practical book.

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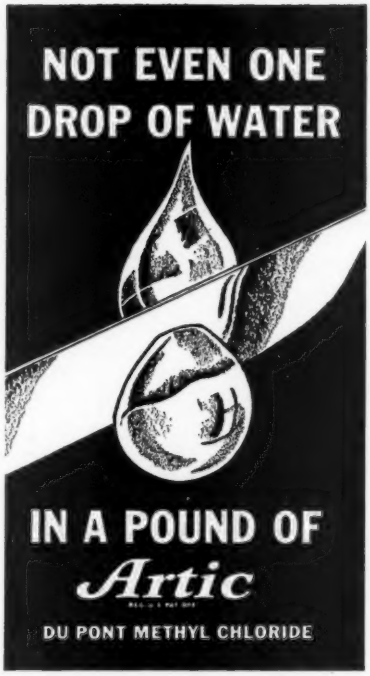

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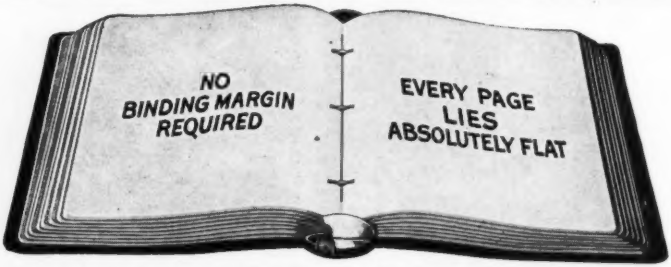

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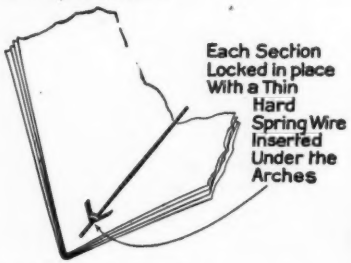

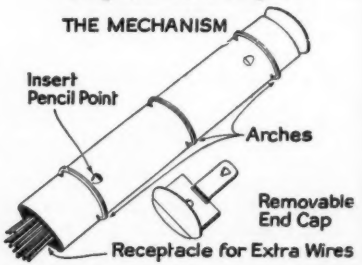

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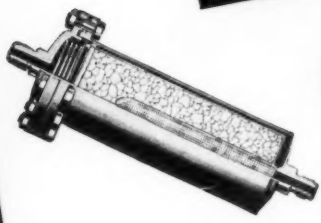

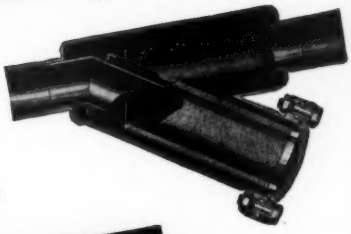

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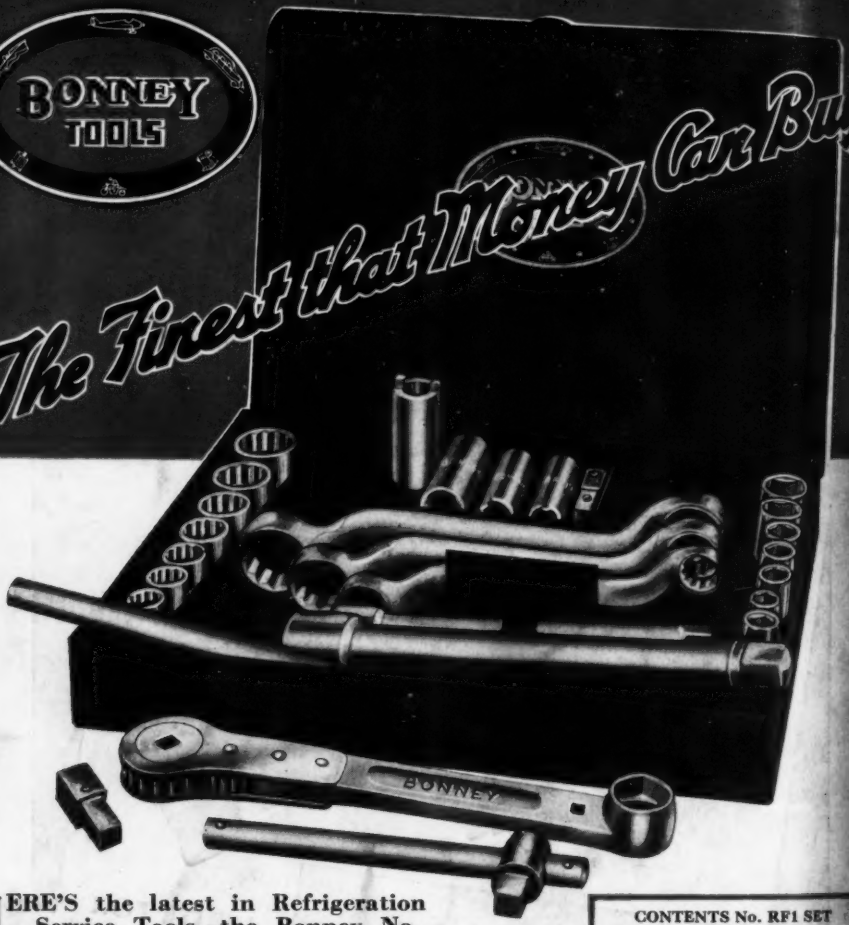

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